

Construction Methods

Road Builders' Number



How 1,800-Mile Alcan Highway was Built

By H. W. RICHARDSON

Access Roads for War Needs

By R. E. ROYALL, Public Roads Administration

Highway Maintenance Under War-Time Traffic

By T. H. DENNIS, California Division of Highways

Flight Strip Construction

Heavy Grading for Airport

ALASKA HIGHWAY IS "HOLED THROUGH" at Beaver Creek in Yukon Territory as Army Engineer bulldozer crews working east and west under command of Lieuts. G. H. Jones and Ralph W. Hunt meet Oct. 25, 1942.

JANUARY, 1943



Dedicating Inland's newest blast furnace. Left to right, front row: J. H. Walsh, vice president; Mrs. Henry Straus, daughter of the late P. D. Block, an Inland founder; Wilfred Sykes, president; and, E. L. Ryerson, chairman of the board.



Inland Lights New Blast Furnace ***First Constructed in Midwest Since Start of War***

Molten pig iron—1,200 tons a day—is now pouring from Inland's newest blast furnace. Long before Pearl Harbor, Inland realized the coming need for greater sustained production of pig iron and steel. Designs were made for a new blast furnace—construction was started late in 1941.

Today, despite handicaps of the labor and material shortages, this privately financed furnace has been completed in record time and is now producing pig iron.

This new furnace takes its place in the

war program, not only to augment production of pig iron, but also to safeguard Inland's needed iron supply in the event that other furnaces, long pressed to capacity, must be taken out of service for needed repairs.

Completion of this new blast furnace is the second major project undertaken and put into operation by Inland since war began. Other projects—including two additional blast furnaces for the Government—all planned to increase tonnage for America's war effort—are rapidly nearing completion.

*Dedicated
to Victory*

INLAND STEEL CO.

38 S. Dearborn Street, Chicago

Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City

ROAD BUILDERS' NUMBER

Appearing prior to the annual convention of the American Road Builders' Association, this issue of **CONSTRUCTION METHODS** is the Annual Road Builders' Number, featuring highway construction and maintenance and the closely related topics of airport and flight strip grading and surfacing. Succeeding issues, of course, will revert to subjects of general construction interest. — Editor.

CURRENT JOBS

.... and Who's Doing Them

BUILDINGS

Public-Turner Construction Co., of New York, will build an industrial plant in Louisiana for \$30,000,000, to be Federally financed. Defense Plant Corp. awarded a \$12,000,000 industrial plant contract in Utah to **M. W. Kellogg Co.**, of New York. **Bechtel-McCone-Parsons Corp.**, of Los Angeles, Calif., was awarded contract to build an industrial plant in Alabama, at an estimated cost of more than \$12,500,000. Housing project is under way in Michigan by **Hunkin-Conkey Construction Co.**, of Cleveland, Ohio, for \$9,500,000. **Howard S. Wright & L. H. Hoffman**, of Seattle, Wash., were awarded a housing contract in Washington, for \$8,000,000 on cost-plus-fixed-fee basis. Buildings are under construction in Mississippi by **A. Farnell Blair**, of Decatur, Ga., for approximately \$5,000,000. At Cedar Point, Md., Navy Department awarded a \$5,360,000 building contract to **Cummins Construction Corp.**, and **Riggs, Distler & Co.**, both of Baltimore. In Kentucky, **Batson & Cook**, of West Point, Ga., will build an industrial plant for \$4,000,000. **Foster-Wheeler Corp.**, of Houston, Tex., received contract for additional plant facilities in Texas amounting to \$2,500,000. Low bid of \$2,499,777 obtained for **Moore & Roberts**, of Seattle, Wash., housing contract in Washington.

HEAVY CONSTRUCTION

Guy F. Atkinson Co., of San Francisco, and **George Pollock**, of Sacramento, were awarded Navy Department contract for improvements in California, to cost \$14,131,008. Another Navy Department contract for additional facilities in Quonset Point, R. I., went to **Merritt-Chapman & Scott Corp.**, and **George A. Fuller Co.**, both of New York, for \$6,065,199. In Oklahoma, improvements are under way by **Johnson, Peterson, Busboom & Rauh**, of Salina, Kan., to cost less than \$5,000,000. In Tennessee, **A. Farnell Blair**, of Decatur, Ga., will make improvements amounting to \$5,000,000. **Williams Bros. Corp.**, of Tulsa, Okla., was awarded contract to construct a fuel pipeline outside United States, for \$4,250,000. Navy Department contract for improvements in Florida went to **Ivy H. Smith Co.**, **S. S. Jacobs Co.**, **Langston Construction Co.**, and **Hubbard Construction Co.**, of South Jacksonville, Fla., for \$3,235,000. Contract for compass swinging base, wood igloos and gravel roads in Michigan was awarded to **J. A. Utley**, of Detroit, for less than \$2,000,000. Bid of \$2,235,000 for floating dry dock in Oakland, Calif., was submitted by **Poole & McGonigle**, of Portland, Ore.

HIGHWAYS

Among recent highway contract awards are the following: Alabama: \$174,881 to **Foster & Creighton Co.**, of Nashville, Tenn.; \$449,171 to **R. T. Smith Contracting Co.**, of Atlanta, Ga. California: \$701,495 to **Fredrickson & Watson Construction Co.**, of Oakland, and **Frederickson Bros.**, of Emeryville, Florida: \$804,200 to **R. H. Wright & Son**, of Columbus, Ga. Georgia: \$990,634 to **Scott Construction Co.**, of Thomasville; \$221,578 to **Jack Smith**, of Atlanta. Louisiana: \$1,274,567 to **W. R. Aldrich & Co.**, of Baton Rouge. Michigan: \$1,000,000 to **Charles J. Rogers, Inc.**, of Detroit. New Mexico: \$466,019 to **Skousen Bros.**, of Albuquerque. North Dakota: \$399,257 to **Archie Campbell**, of Warwick, Ohio: \$555,847 to **A. J. Baltes, Inc.**, of Norwalk; \$644,994 to **A. J. Baltes**, of Norwalk. Pennsylvania: \$327,484 to **Baldwin Bros. Paving Co.**, of Cleveland, Ohio. Texas: \$500,000 to **Rock-Road Construction Co.**, of Chicago, Ill. Utah: \$245,827 to **Enock Chytraus**, of Salt Lake City.

CONSTRUCTION METHODS was founded in 1919, under the name of **SUCCESSFUL METHODS**, by the Manufacturers Publicity Bureau, Inc., of Chicago, representing a group of non-competing manufacturers of construction equipment. Charles R. Thomas, editor of the first few issues, was succeeded by William Jabine. In 1926 the McGraw-Hill Publishing Company, Inc., of New York, purchased the publication, changing its name to **SUCCESSFUL CONSTRUCTION METHODS** in November of that year, to **CONSTRUCTION METHODS** in May, 1927, and to **CONSTRUCTION Methods and Equipment** in December, 1926. In October, 1939, the name **CONSTRUCTION METHODS** was resumed. All rights to the foregoing titles are reserved by the publishers.

Robert K. Tomlin was appointed editor of **CONSTRUCTION METHODS** in January, 1928. Vincent B. Smith is associate editor; N. A. Bowers, Pacific Coast editor; Nelle Fitzgerald, assistant editor, and Paul Wooton, Washington representative.

JANUARY, 1943

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Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

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N. A. Bowers (San Francisco) Nelle Fitzgerald

A McGRAW-HILL

PUBLICATION

The HOW of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

- How **STREET-CAR TRACKS** were replaced with paved median strip. —p. 39
- How **ACCESS ROADS** are built to serve nation's war needs. —p. 42
- How **BRIDGE RAIL** was formed of temporary wood panels to save critical materials. —p. 45
- How **BALANCED EARTHMOVING OUTFIT** graded airport in 70 days. —p. 46
- How **TRACTOR LUBRICATION** was done in field by specially equipped service truck. —p. 47
- How **FLIGHT STRIPS** for emergency landing and takeoff of aircraft were built on West Coast. —p. 50
- How **ASPHALT SURFACE** of paved airfield runway was placed in two courses by spreading-finishing machine. —p. 51
- How **SHIELD "TUNNEL"** was built of wood and wallboard as setting for motion picture. —p. 52
- How **WATERFRONT** was modernized by razing buildings and paving 6-lane drive. —p. 54
- How **WINCH ON TRACTOR** pulled down walls for building demolition. —p. 54
- How **BLITZ CONSTRUCTION** completed army airfield in 70 calendar days. —p. 57
- How **CLAY-GRAVEL MIXTURE** for stabilized shoulders was produced by portable crushing plant. —p. 57
- How **PERFORATED BUCKETS** assured drainage of material excavated by dragline. —p. 59
- How **DELIVERY OF CONCRETE** for industrial building was handled by 120-ft. steel tower. —p. 60
- How **WOOD COVERS** for sewer manholes save critical metal. —p. 60
- How **SIDE CUTTERS** on trenching machine increased effective digging width. —p. 61
- How **BLOCKS OF MELTING ICE** lowered cast-iron water main under pressure. —p. 61
- How **TAR CONCRETE** was laid by four paving machines. —p. 62
- How **ALASKA HIGHWAY** was built in record time despite unusual difficulties. —p. 64
- How **STATE MAINTENANCE FORCES** restored war-battered roads. —p. 70
- How **SAND-ASPHALT RUNWAY** was constructed of local materials for flight strip. —p. 72

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Power—Giant Arm of Production

Ninety Per Cent of American Industry Is Electrified

ELECTRICITY is the mainspring that turns the wheels of our factories, mills and mines. It is the tireless arm that grinds our grain, weaves our cloth, pumps our water, builds our planes, our guns, our ships, our cars, our trucks and tanks...

The mighty Pharaohs had less energy at their disposal in building their pyramids than is generated today by one single power plant. The combined capacity of America's central power systems is without parallel in the history of the world... 46 million kilowatts, i.e., 65 million horsepower in steam turbines, hydro turbines and other prime movers. That is more power, day in and day out, than 650 million slaves could produce—for a limited time—minutes in fact.

The capacity of this vast fountain of energy is beyond the grasp of the average man who flips a switch and sets in motion machines that perform the labor of a thousand man-hours in a matter of minutes. Perhaps only the old time farmer, whose traditional source of power is a team of tired horses and a pair of calloused hands, knows how to appreciate this commodity that is so vital an ingredient of everything we consume and use.

Yes, we take electricity for granted. We expect it to appear in unlimited quantities, like water and air, as we need it. Almost as essential as these two elements in times of peace, it becomes a matter of life and death in times of war. Industry would collapse without it and the nation would quickly perish.

With the catastrophe of Pearl Harbor a little over a year ago, came the realization that we had to out-produce our enemies. To out-produce our enemies, who had a seven year head start, meant to turn more wheels than they were turning and to turn them faster than they were turning them.

New plants sprung up overnight. Production increased beyond our wildest dreams. Aircraft and shipbuilding surpassed the most daring forecasts. The machine tool industry's output grew to a volume that bordered on the miraculous. Guns, shells, uniforms, shoes, tanks and a thousand other items were being made in hitherto undreamed of quantities. All of them have one common essential ingredient—power. Industry demanded power—more and more power!

It is no small tribute to the power industry that, while other raw materials developed shortages necessitating strict priorities control, electricity remains unrationed—no priorities, no curtailments, no rate increase. Current industrial consumption is running 16 per cent over 1941 and 50 per cent over 1940. Not spectacular perhaps but when we consider that the nation's 26 million domestic consumers utilize only about 14 per cent of the energy output, we begin to get some idea of industry's power consumption.

Our power companies might have been stunned by the prospect of mounting demands for kilowatts. Instead they set about developing and coordinating a multiplicity of relatively small and seemingly unrelated factors. Individually or even collectively, these have not been of a spectacular nature. Certainly they have not inspired the award of the Army-Navy E although they are an essential ingredient in every Army-Navy E that has been awarded to

American industry.

The contribution of the power industry to the winning of the war is not likely to flame forth in newspaper headlines. It takes the more prosaic turn of portraying an industry that is doing wonders quietly, unobtrusively.

At the close of the last war the power at the disposal of the American industrial worker averaged $3\frac{1}{2}$ horsepower. At the beginning of this war, twenty years later, it had increased to $6\frac{1}{2}$ horsepower. What other nation can even approach that figure? This large provision of power is the achievement of the electric utility industry. For years it had built and applied its equipment to the highest standards of performance and operated its systems to equally high standards of service and dependability. Always recognizing that "public service is a public trust" it had maintained wide margins of security in performance. Today these margins are the source of the power industry's ability to rise to the emergency.

In short, the electric utilities were prepared! Power men are accustomed to looking ahead, to prepare for growing loads and allow for unforeseen contingencies, for electricity cannot be stored. It is "ordered" by touching a switch. It is delivered and consumed at the same moment.

Months before the actual outbreak of hostilities foresighted power men set to work computing how much life of equipment could be risked in the process of crowding it toward greater output. Generators, boilers, turbines, cables, transformers and even conductors underwent close scrutiny in an effort to increase the load—safely. They figured, they experimented, they tried untried measures.

Insulation, for example, is the crux—the least known component of electrical apparatus. When it lets go the service suffers. It is not easy to know how near any bit of crucial insulation is to letting go. It takes courage to work it to a point just short of failure... but that is exactly what is being done today.

Technological forcing of equipment, however, is not all of the story. Obsolescent equipment has been rehabilitated; salvage has been intensified; critical metals have been replaced by non-critical materials; water sprays, air-blowers and other cooling methods have been installed to keep over-loaded apparatus from overheating. Nothing has been overlooked. Ingenuity has contrived the well nigh impossible.

Hand in hand with these measures of expediency have gone measures of intensification. Hydrogen pressure for cooling generators has been stepped up from ounces to pounds taking more heat away from the machines and ena-

bling them to carry greater loads. Capacitors—little more than aluminum foil interleaved with thin paper—have been applied by the carload relieving the systems of that mysterious reactive current which is associated with that equally mysterious power factor. They have performed wonders in avoiding the need for additional generating and transforming equipment. The use of portable sub-stations has averted the otherwise necessary reserve capacity in fixed installations at many points.

When coal was placed on the urgent list last spring the electric utilities outstripped all other industries in providing storage for the winter. Stocks on hand the first of October were sufficient for 105 days, or more than twice what would be considered adequate in times of peace.

When staff losses to the armed forces became serious, power companies contrived measures that enable them to get along without aggravating the national manpower situation by hiring others to replace them. Today meters are being read every two or three months instead of monthly, women are being trained to do drafting, keep the logs in power plants and sub-stations and to test meters in shops and laboratories.

On the summit of "Grandpa's Knob", a mountain overlooking Rutland, Vermont, stands a giant windmill that would have been the delight of Don Quixote. Towering 200 feet above the tree tops its mighty 175 foot propeller turns with the wind and drives a 1,000 kilowatt generator which feeds its output into the Central Vermont Public Service Corporation's power system... the most ambitious wind turbine generator in the world, and a daring experiment of forward-looking men.

Today everything electrical is being tried; is being worked harder than it has ever been worked before.

Great credit is due the men behind the electric power industry. These men have recognized the responsibility of their jobs—it is a part of their very being. Theirs is the kind of service that must be maintained. No soldier is truer to his trust than is the employee of this great industry.

The service must go on! No matter what happens—acts of God or deeds of men—the service must go on! Labor disturbances may disrupt other industries but there have been no shutdowns due to labor trouble in electric power plants since Pearl Harbor.

And this winter when blizzards pile up drifts and sleet makes pavements slippery there may be absenteeism from other plants but the utility employees will be on the job ready to climb the ice-covered poles and repair the ice-laden lines whenever the call comes.

In this war the least costly yet the most precious element of production—electricity—will be ever ready to "man" the machines that will produce the weapons that will give victory to the forces of freedom.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This is the seventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Teach



WHAT 'INCOR' DOES FOR YOU IN
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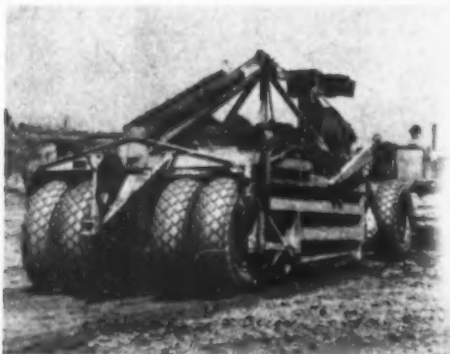
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The Firestone GROUND GRIP

This greatest of all traction tires is for use on driving wheels of earth-moving units in soft going. The patented triple-braced tread design is self-cleaning and provides constant traction where ordinary tires would slip and spin.

The Firestone EARTH MOVER

This tire is designed primarily for free rolling wheels. It operates at low inflation pressures to prevent impact breaks from rough terrain and provides maximum flotation in soft going.

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This tire should be used in coal and ore strip mining or in quarrying. Wide chevrons, closely spaced, and an extra-tough rubber compound protect the body from cutting and snagging.

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- ★ Will assist your tire service man in setting up a regular routine for earth-mover tire maintenance.



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from LOS ANGELES "TIMES"

Navy Takes Over Diesel School

Buildings Once Used by Military Academy Now House Sailors

Ready for an intensive course that might well be entitled the "care and feeding of Diesel engines," 150 enlisted men of the United States Navy arrived here yesterday and "took over" the buildings formerly occupied by the Harvard Military Academy at 1600 S. Western Ave. Training of the men will be handled by the Hemphill Insti-

They'll Fight the Diesel Way

Experts Who Will Maintain The Powerful Engines That Will Drive Army's Big Tanks And Other Machines Are Being Trained At School Now Under Way In Memphis

THOSE nearly 400 soldiers who four times each day march smartly up or down Adams Avenue are not here just to be taught the rudiments of infantry drill.

For instance, that young man with the curly hair you have noticed in the first company may be driving a Diesel truck in Egypt or Australia, or

Ralph Hemphill, the founder of the Hemphill schools for several years had two Auburn cars equipped with Diesel engines and these cars continually toured the country with fuel costs that were so low that they seemed almost unbelievable.

The Diesel for years has been making steady progress as a power unit for tractors and stationary engines such as are used on farms. Thousands of heavy trucks also are Diesel-

from THE MEMPHIS "COMMERCIAL APPEAL"

Diesel School "Enlists" For the Duration

Those men, young and experienced, at the Hemphill Diesel School who are being trained in the operation and maintenance of Diesel engines and other machines are "enlisting" for the duration.

The Hemphill Diesel School at Long Island City, N. Y., has been the training center for the U. S. Army, Navy and Coast Guard for several years. The school has been equipped with the latest Diesel engines and other machines. The school is now training men for the duration of the war.

The school is made up of 24 men, the majority of whom are taking the course in Diesel engine operation and maintenance. They are given quarters in a hotel in New York City and their travel expenses are paid by the school.

A kind of 24-hour instruction is given in the school. The men are given practical training in the operation and maintenance of Diesel engines and other machines. The school is now training men for the duration of the war.

from "DIESEL POWER"



HEMPHILL TRAINING

for all the Armed Services



A major part of the extensive facilities and the experienced personnel of Hemphill Diesel Schools are now enlisted for the duration . . . they are training men from the Army, Navy and Coast Guard in Diesel engine operation and maintenance. We are proud that we can make this contribution to our war effort . . . and of this recognition of the importance of Diesel, and Hemphill trained men.

The greatly enlarged Hemphill Diesel School in Los Angeles is training men from the Navy—all the equipment of the Chicago Hemphill School including the Hemphill texts are being used for Navy Diesel training—at Memphis, the U.S. Army has contracted for the Diesel training of Army men—and at the New York Hemphill Diesel School a large number of Navy men recently completed their Diesel training and have been followed by an assignment from the Coast Guard.

Many young men in our Armed Services will receive their first knowledge of Diesel engines in these Hemphill training programs . . . knowledge that may prove highly valuable in the post-war commercial world. Similar training is available to men in civilian life who recognize the growing importance of Diesels and wish to prepare for openings in this field.

HEMPHILL SCHOOLS, Inc.

3128 QUEENS BOULEVARD, LONG ISLAND CITY, NEW YORK

It is gratifying, after many years of successfully training civilian Diesel operators, to be chosen by the Government to assist in the important task that lies ahead.

Ralph Hemphill
Chairman of the Board and Founder

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WHAT ABOUT DRIVE
AND IDLER ROLLERS? ...
BUILDING
UP TREAD
TEETH ...

REPAIRS TO DRUMS
AND BEARINGS ...

THEW-
LORAIN

Emergency
FIX-IT
Handbook

PLEDGED
CONSTRUCTION
EQUIPMENT
CONSERVATION

HOW TO RESHAPE
TREAD PINHOLES ...

24 PAGES of How to Keep 'Em On-the-Job IDEAS

HERE'S a brand new handbook for all Lorain owners and operators, full of practical ideas on how to make quick, emergency repairs that will keep your machine going. It will tell you how to temporarily substitute for critical, hard-to-get parts and materials—*how to do more with what you've got.*

Many of the suggestions are temporary expedients only, but they will keep your machine on the job—they will help to salvage and conserve worn parts, and will save you time and money, too. Write for your free copy of the Fix-It Handbook now or clip and mail the pledge form below if you want both the Handbook and a Conservation Emblem.

HOW TO GET THIS CONSERVATION EMBLEM

If you want to show others that you are helping to make your equipment last longer, sign and mail the pledge form below. Regardless of the type or make of your equipment, we will send you a colorful red, white and blue emblem (actual size 5" diameter).



THE THEW SHOVEL COMPANY, Lorain, Ohio

I hereby pledge that I shall do all in my power to prolong the life of any construction equipment in my ownership or care regardless of type or make.

I realize that it is my responsibility to avoid time-consuming delays caused by mechanical breakdowns and will see that frequent inspections are made and that necessary adjustments and repairs are promptly taken care of.

I will avoid waste of parts and materials and will eliminate any abuse of my equipment due to non-recommended operation.

Signed _____

Street Address _____

City _____

State _____

FIX-IT Handbook Wanted..... Lorain Model No..... Serial No.....

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DRAGLINES • MOTO-CRANES



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These lubricants give efficient wear protection in the hard grind of full load operation and promote top yield of continuous service hours.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



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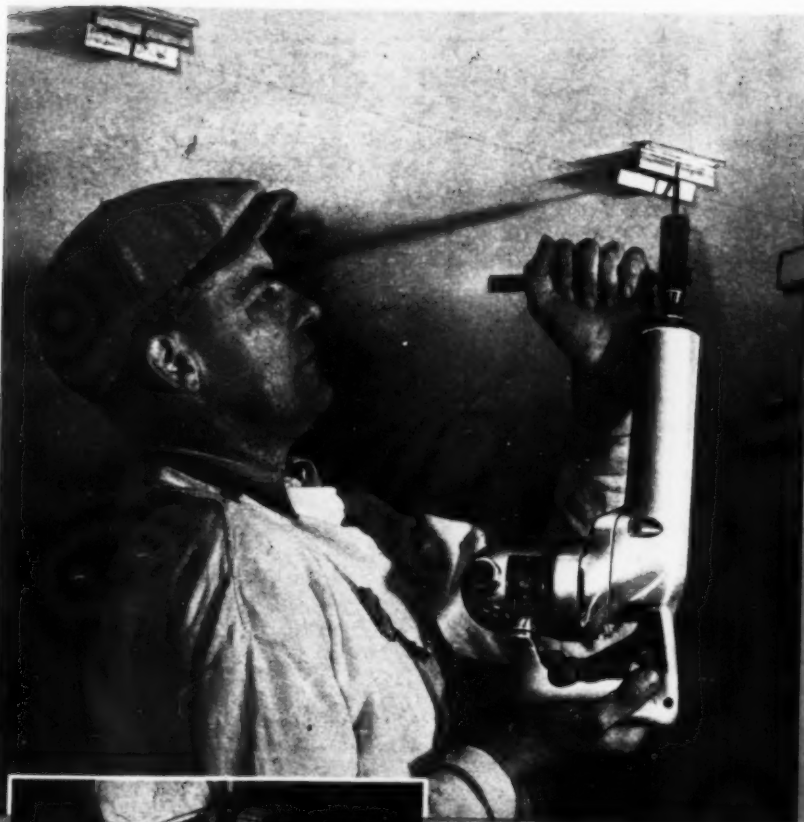
573 WEST PEACHTREE STREET
ATLANTA

FAIR BUILDING
FT. WORTH

Black & Decker Electric Hammers

SAVED 2100 MAN HOURS

on this
War Housing Project



ON ARMY CAMP OR INDUSTRIAL PLANT CONSTRUCTION, time-saving Black & Decker Tools get the call. Here workman is sawing form panels for concrete foundations on big building project with Black & Decker Portable Electric Saw.

FASTENING 50,000 CLIPS TO CEILING for apartment partitions is not nearly so tiresome this way. Workmen on the Detroit housing project found their arms did not tire so easily when they used light weight B&D #32 Electric Hammers for drilling.

DRILLING HOLES FOR 520,000 FEET OF METAL RAIL, to be fastened to concrete floors, goes twice as fast with Black & Decker Hammers on the job. Operators claim B & D's hit harder, are far sturdier, require less servicing than other makes.



Credit for 100% PRODUCTION INCREASE in plastering and lathing two thousand units of a \$900,000 Detroit apartment housing project goes to Black & Decker Portable Electric Hammers. So says the Thomas King Company, plastering and lathing contractors, who used the hammers to drill holes for fastening down 520,000 running feet of metal base, and 60,000 metal clips—which serve as bases for hollow plaster partitions.

Black & Decker Hammers cut drilling time exactly in half—from 30 to 15 seconds per hole. On approximately 500,000 holes, the contractors figure they saved *more than 2100 man hours*—about \$4200 on the company books. Quite a tidy saving!

And that's the story throughout big scale construction projects. Contractors find that husky, time-saving Black & Decker Tools help keep them on top of contract schedules—do all jobs faster and better from sawing or boring timbers to driving screws or drilling holes in concrete. They find, too, that if repairs are needed, one of Black & Decker's 26 factory branches from coast to coast is right at hand, ready to give *quick* expert service.

Your nearby Black & Decker Jobber can help you select the right tools for your needs. Phone him today for a demonstration.

DO JOBS FASTER —

Send for these FREE handbooks showing how Black & Decker Tools can do your job faster. Check the ones you want, mail to The Black & Decker Mfg. Co., 739 Penna. Avenue, Towson, Md.

- ☐ GENERAL TOOL CATALOG
- ☐ DRILL USE BOOK
- ☐ HAMMER HANDBOOK
- ☐ SAW HANDBOOK



Uncle Sam Does Need Your Scrap - How About It?



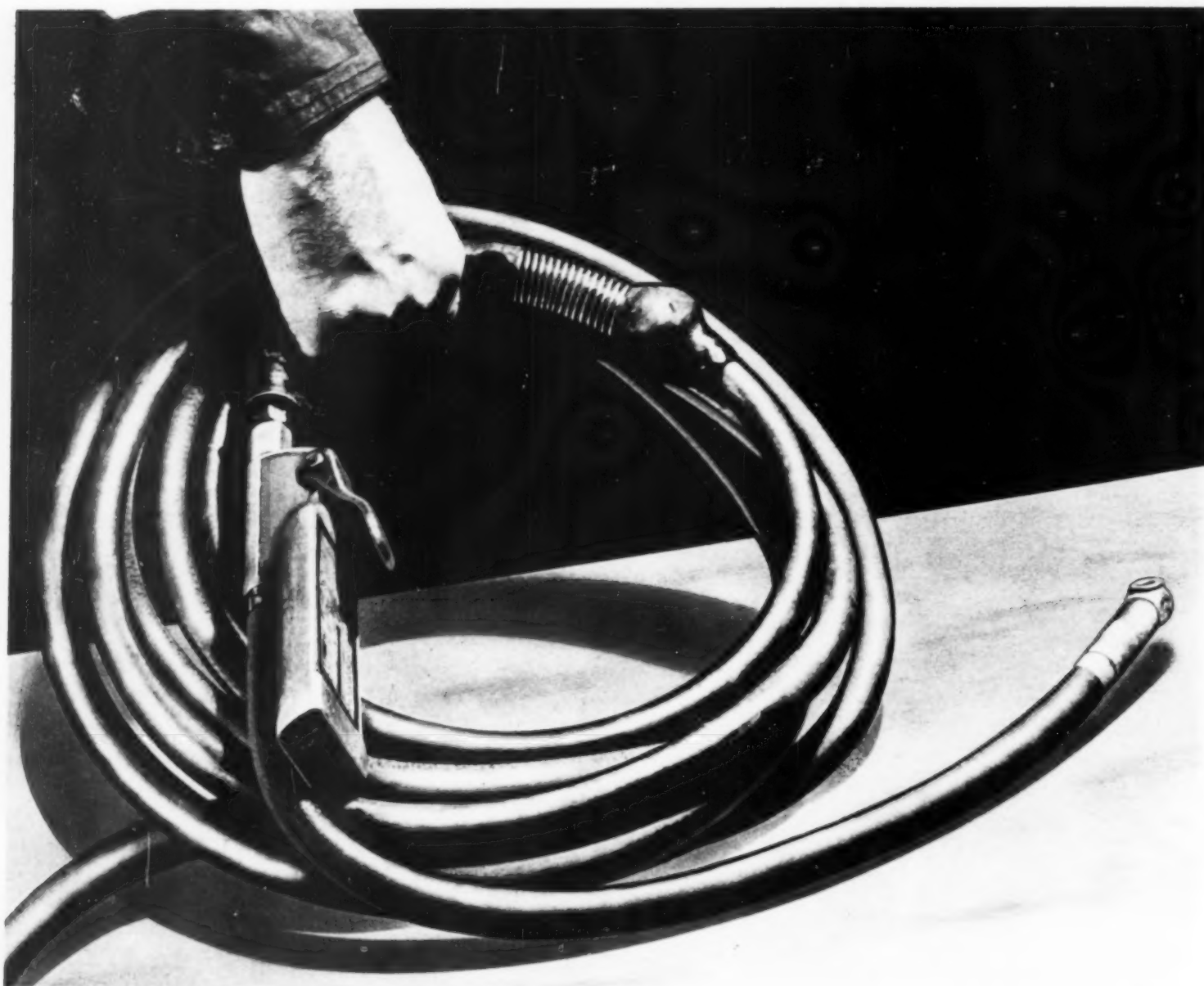
Broken tools, obsolete equipment, scrap metal of all kinds is still lying around waiting to be thrown into the fight. So — don't delay — Get in the Scrap with Your Scrap!



LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS



He Found \$1000 in an Air Hose

A typical example of B. F. Goodrich leadership in truck tires

TRUCK tires were wearing out and blowing out long before their time. Hours and days were lost due to road delays. Tire repairs were costly. Precious rubber was being wasted. Truck owners did their best to correct this situation, but still found tire life too short.

B. F. Goodrich recognized this problem. Drawing on the experience of many years in handling completely the tire maintenance for large bus fleets, the company announced the B. F. Goodrich Tire Conservation Service for fleet operators. This is a comprehensive, point-by-point program under which factory-trained engineers take over the complete supervision of tire care.

Some of the country's largest fleet owners signed up for this low-cost plan immediately. B. F. Goodrich engineers found ways to cut costs over-

night. Improper inflation was a source of trouble in many fleets. In one case where this condition was particularly bad, our engineer set up proper schedules, quickly corrected the errors, and reported, "We found \$1000 in the air hose."

And here's what the operators said: "We believe we will show a 25% saving." "It saves far more than it costs." "The number of failures has been reduced over 60%." "We have had only one failure in 149,863 miles."

With results like that it's no wonder that thousands of trucks are now being handled under this plan. For this is not just another tire conservation program, good as they are. This program, based on putting tire maintenance in

the hands of trained tire engineers, is the first of its kind to be offered by any rubber company—another example of the leadership which has made B. F. Goodrich "First in Rubber". If you would like details of this scientific tire conservation plan and how it can be applied to construction equipment, write

Tire Conservation Dept., The B. F. Goodrich Company, Akron, Ohio.



Get the most out of YOUR TRACTOR with

BUCKEYE CABLE CONTROL



ADDING Buckeye Cable control to your tractor steps up its output two ways . . . first, you'll get higher output from your cable-controlled equipment with Buckeye's fast, accurate winch; second, your tractor can handle scores of new and different jobs with Buckeye's smooth, rugged cable power.

Using a two-drum Heavy-Duty Hoist, one drum can operate your dozer, ripper or scraper, leaving the second drum free to operate another piece of equipment or ready to handle the dozens of cable pulling, hoisting or hauling jobs that turn up on every project. Spooling 350 feet of $\frac{1}{2}$ " cable, the wide, husky Buckeye-drum gives you over 8,000 lbs line pull and a line speed of more than 300 ft. per minute. For hoisting jobs, your line can be reeved through single or multi-part sheaves—plenty of cable to work with, plenty of line pull for the tough ones. Simple job-made hoist frames can be mounted at the front, rear or sides of the tractor. Line may be run out directly from the drum to snake logs, pull out stalled equipment or pull cable, fencing, etc.

To get the *most* out of your tractor, equip it with Buckeye Cable Control **NOW!**

Write for specifications and data on Buckeye winch models to fit your tractor . . . today.

THE BUCKEYE TRACTION DITCHER COMPANY
FINDLAY • OHIO

**WITH
BUCKEYE
CABLE CONTROL,
YOUR TRACTORS
CAN DO MORE
JOBS!**

Built by Buckeye

Convertible Shovels



Trenchers



Tractor Equipment



R-S Finegraders



Road Wideners



Spreaders



NEW! Wartime Buyers' and Users' Guides

These Books Tell All About BLACKHAWK'S
famous Time and Labor Saving
EQUIPMENT FOR CONSTRUCTION

Here Are Big,
New Ideas to Help You
BEAT THE SCHEDULES!



PORTO-POWER — Something revolutionary in Hydraulic Jack design. Works in all directions! One unit can build up to *any practical length* — eliminating need for miscellaneous jacks and dangerous and cumbersome blocking up. *Sure it lifts* — but Porto-Power also PULLS, SPREADS, CLAMPS, BENDS and PRESSES! Hundreds of amazing uses around every construction project. Available with 7, 10, 20 and 50 tons of power.

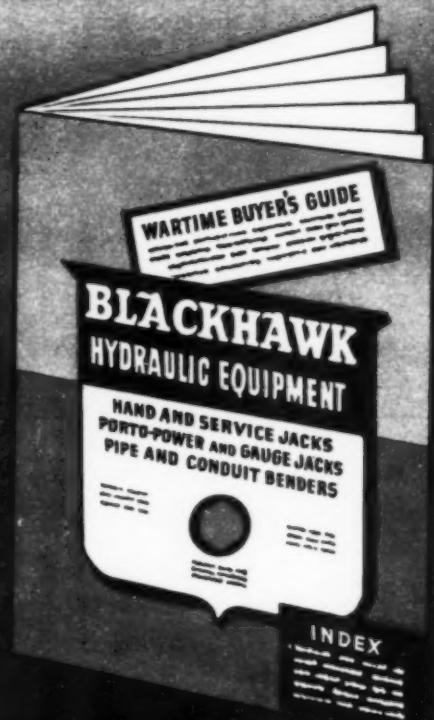
PIPE & CONDUIT BENDERS — Stop worrying about getting factory formed bends and elbows — or losing time in "belly wrestling" pipe. Low cost Blackhawk Benders handle up to 4" pipe — *right on the job!*

HYDRAULIC HAND JACKS — No need to assign several men to each jacking job — *one man* can operate any Blackhawk Jack — even the brute 50-tonner! That's only part of the big story on why Blackhawk 3, 5, 8, 12, 20 and 50 ton Jacks can help you beat those schedules!

GAUGE JACKS — The most practical, economical and portable field testing equipment available. Tells whether materials, soil or structures can "take it".

MODERN WRENCHES — Yes! There's a mighty big difference in wrenches. Blackhawk Socket Wrenches cover the full range — from midgits up to whopper sizes. More than that — they have the "Lock-On" feature — important to speed and safety on construction work. Also — get the story on Blackhawk Torque Wrenches, Box-types, and Open Ends.

Products of **BLACKHAWK MFG. COMPANY**
Department P2313 Milwaukee, Wisconsin



BLACKHAWK
MFG. COMPANY
Department P2313
Milwaukee, Wis.

Rush the two New
Buyers' and Users' Guides
on Blackhawk Hydraulic Equip-
ment and Wrenches being pro-
duced to speed up wartime construction.

BLACKHAWK

Name.....

Company.....

Address.....

Correct Lubrication...

is your wire rope's
BEST FRIEND!

If wire ropes are to give their best service—yes, even longer-wearing **HAZARD LAY-SET PREFORMED**—they must be lubricated regularly—and correctly. Not only will proper lubrication protect the many wires from corrosion and excessive wear, but will permit the internal wires which move one against another when the rope passes over a sheave or winds on a drum, to slide more freely and with less friction. For some short-lived services, factory lubrication is sufficient. For others, additional lubricant must be added in the field, and unless this is done with sufficient frequency, your wire rope is doomed to fail before its proper time. And this is no time to waste steel

HAZARD LAY-SET PREFORMED WIRE ROPE ordinarily gives so much better, easier-handling, longer service than ordinary non-preformed rope that occasionally operators take its exceptional qualities for granted and forget the oil can. Don't do it. Lubricate your **LAY-SET** correctly, and you will get even *longer* service—even *greater* dollar value. All Hazard ropes identified by the Green Strand are made of Improved Plow Steel.

HAZARD WIRE ROPE DIVISION Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma
AMERICAN CHAIN & CABLE COMPANY, INC. Bridgeport • Connecticut

● IMPORTANT SUGGESTIONS

Clean wire rope thoroughly before lubricating. Use kerosene and wire brush.

Passing the rope through high-pressure jetted steam has proved a very effective means of cleaning, especially larger diameters.

Wipe off excess lubricant.

Frequent lubrication with light-bodied lubri-

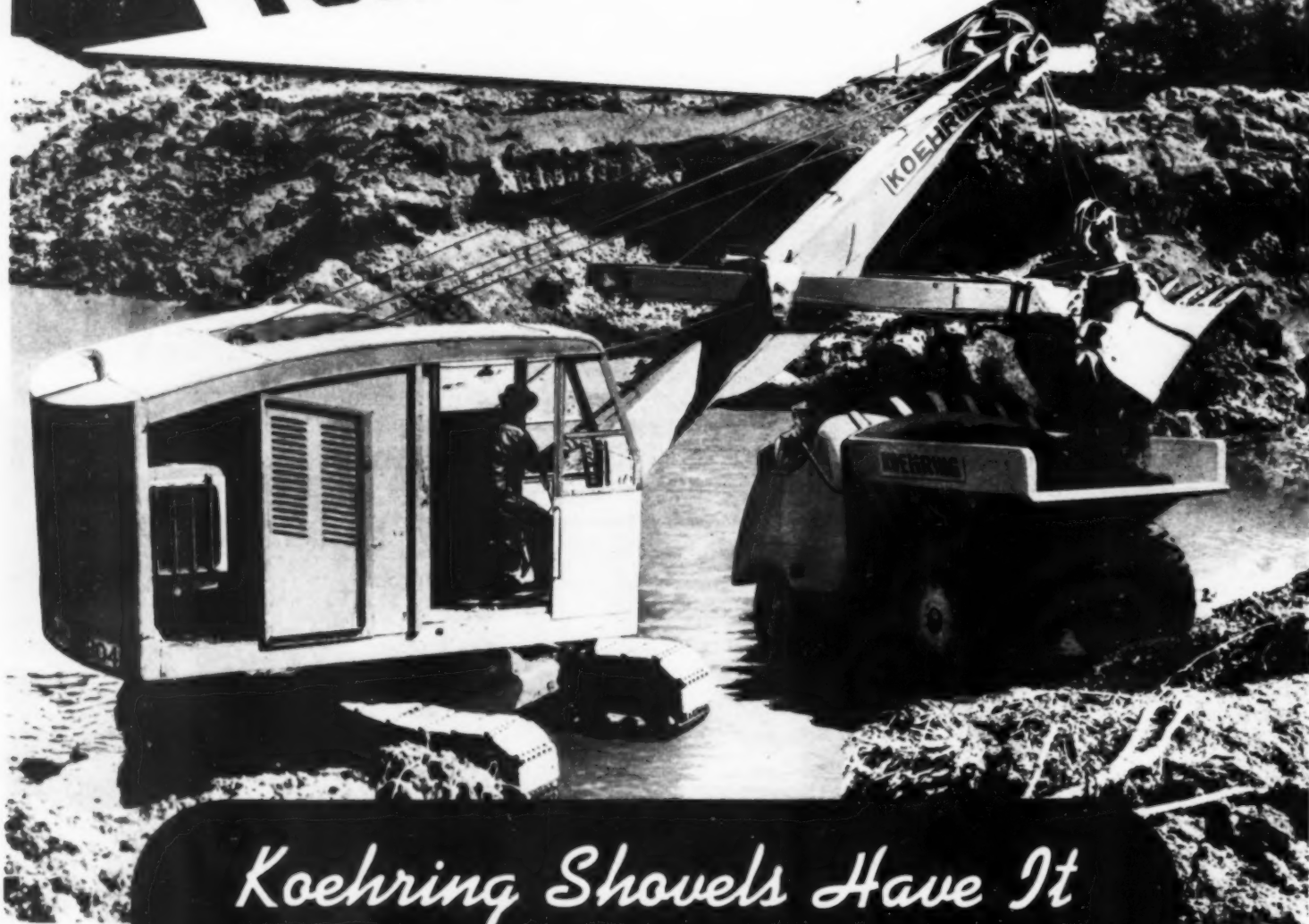
cant is better than infrequent treatment with heavier lubricants.

Lubrication of any wire rope is sufficiently important to warrant calling in one of the industrial lubrication men employed by oil companies or a Hazard man. These men can tell you which lubricant will handle your problems best.

HAZARD LAY-SET *Preformed* **WIRE ROPE**



RESERVE POWER FOR HIGH OUTPUT



Koehring Shovels Have It

Koehring shovels have the reserve power and the stamina to take the extra burden of round the clock performance day after day. The extra speed which has helped them set output records on ordinary work is now helping to do the extraordinary job required. Sustained output is assured by the ability of Koehring shovels to take hard service with little time out for breakdown or repair. These features keep Koehring shovels digging-hard: All welded construction . . . chain crowd . . . self-cleaning crawlers . . . heavy duty motor . . . welded dipper . . . and many more.

KOEHRING COMPANY • MILWAUKEE, WISCONSIN

HEAVY-DUTY CONSTRUCTION EQUIPMENT

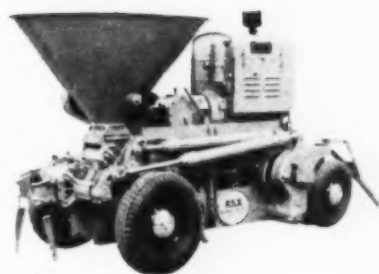




Two Rex 160 Pumpcretes are used here to send concrete to every part of this plant construction job.

CONCRETE GOING UP... Man-Hour Costs Going Down!

Want to cut down man-hour costs on your concrete job? That's what the Rex Pumpcrete and pipe line can do for you—just as they've done in the placing of millions of cubic yards of concrete on jobs of all sizes, all types.



WHAT'S become of the engineers who said that Pumpcrete just wouldn't do for them? We'll tell you—most of these engineers are now Pumpcrete boosters, who can tell you a story of cost reduction by using the Pumpcrete on everything from tunnel jobs to drydocks, warehouses, piers and emplacements—in fact, on every type of concrete job!

The others? Today, even the "die-hards" are turning to Pumpcrete, too. Because, today, speed is the essence of the job that faces the American construction industry; and speed-

ier placement of concrete is a basic Pumpcrete advantage. Furthermore, the Pumpcrete pipe line doesn't interfere with other construction operations.

Pumpcretes are made in models with capacities ranging from 15 to 65 cu. yd. per hr. The technical details and performance data you would like to know are fully explained in the book "Pumpcrete Practice," a copy of which will be sent to you upon request. Chain Belt Company, 1664 West Bruce Street, Milwaukee, Wisconsin.

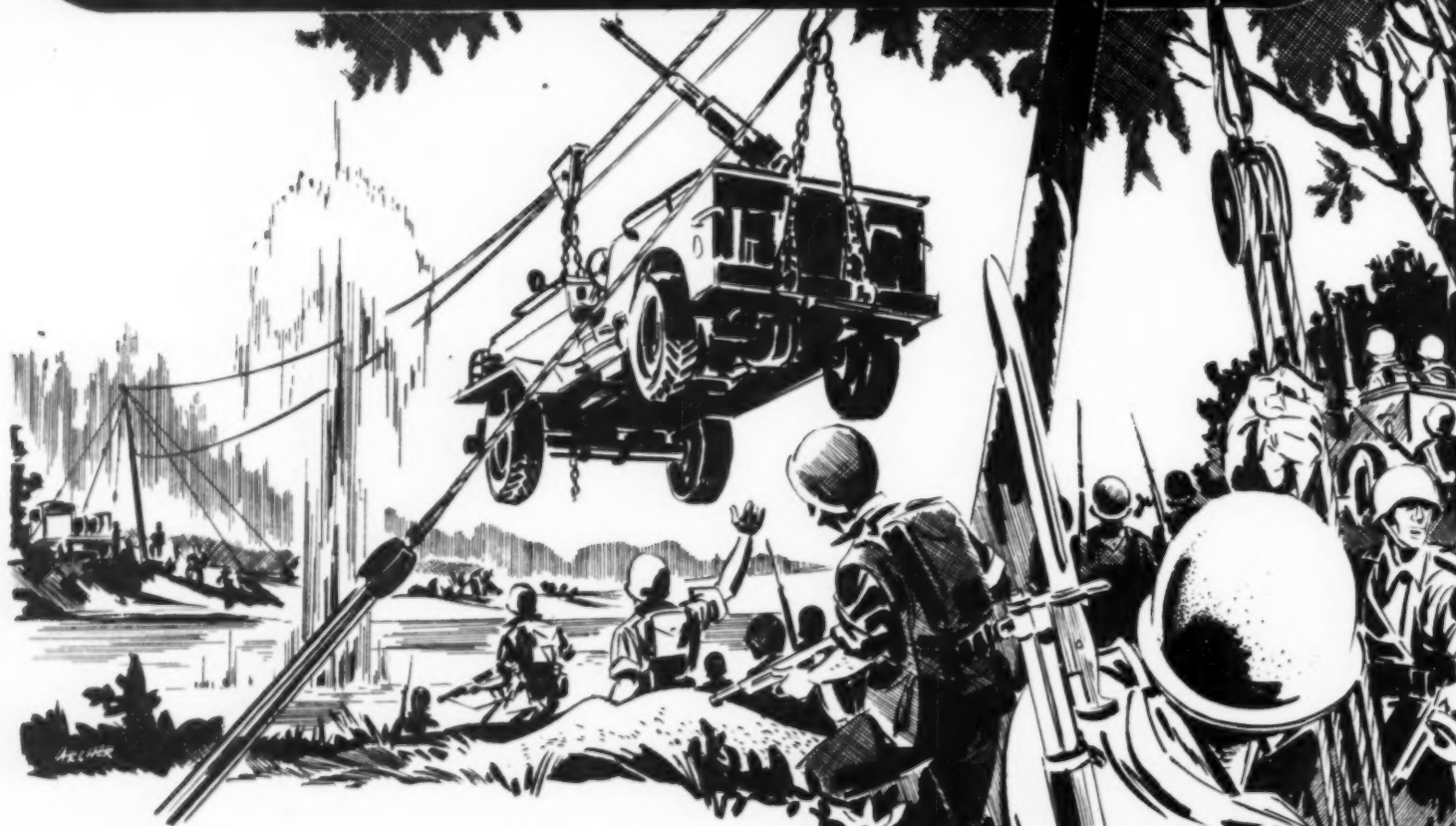


PUMPCRETE
THE PUMP THAT PUMPS CONCRETE

DETROIT PUBLIC LIBRARY

CHAIN BELT COMPANY OF MILWAUKEE

Swinging Jeeps across the Creeks...



ROEBLING "Blue Center" won't let them down!



It's a fast-flowing stream. A pontoon bridge won't do... So watch the Engineers swing one of their mobile cableways into action. A soldier swims across and a boat follows the line that was lashed to his body. Then comes the Roebling guy lines, bridge cable and anchorage tackle. In no time at all, the motorized winches are hauling jeeps and trucks across the 700 foot span.

It's another of those wartime miracles where the Corps of Engineers wrote the ticket and Roebling supplied the wire-

making experience and the wire rope.

Experience from a hundred industries... and steel that exactly meets the needs of each. Wire rope... right for factory cranes or power shovels or bulldozers... right for victory ships or oil well lines or mine hoists. Experience that is woven into every inch of Blue Center, giving it the stamina to withstand unusual loads on the battle or production line.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches and Warehouses in Principal Cities

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PREFORMED OR
NON-PREFORMED



WIRE ROPE IS INDISPENSABLE TO WAR

You can do your part to speed output and conserve steel for all America by getting the most out of the wire ropes you have. Faulty sheaves, for example, may be killing your ropes... preventing them from delivering the full service life that has been built into them. Here are a few things to look for:

- 1 See that no sheaves are out of alignment.
- 2 Check with a gauge for deeply worn or cut grooves.
- 3 Watch out for broken rims.
- 4 Check for worn or damaged journals that cause sheaves to stick or wobble.

- 5 Check for bent shafts that cause whipping or vibrations.

To help you inspect wire rope sheaves systematically and easily, we have prepared the helpful pamphlet shown left. Our nearest office will furnish as many copies as you need.

P&H

A Tip on Upkeep-

REDUCE LOST TIME OVER 50%

Study your care and operation manual. Keep tools on hand so you can make adjustments during operating time — when oiler is lubricating — before starting work — at the end of shift — or between trucks. Timely adjustments keep your machine in tip-top shape and they can cut delays as much as 50% to pile up more yardage for Uncle Sam's war effort!



More FOR YOUR EXCAVATOR DOLLAR

Awarded the Navy "E" for excellence in war production, P&H displays it also as a pledge of future effort.

Helping to reduce maintenance are these basic P&H advantages:
ROLLED ALLOY STEELS stronger, tougher — provide greater resistance to metal fatigue.

ALL-WELDED CONSTRUCTION of both upper and lower structures — more rigid to prevent "weaving" and save you many repairs.

TRUE TRACTOR-TYPE CRAWLERS mean dependable travel — and an end to old crawler troubles.

HYDRAULIC CONTROL smoother, positive, easier, faster — better in every way.

Severe war-time schedules are proving the extra values built into these advanced P&H's.

General Offices: 4494 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS



HOISTS • WELDING ELECTRODES • MOTORS



VICTORY

CRANES

DRAGLINES · SHOVELS

PROGRAM

To our many customers, prospective customers, and operator friends who are working both ends against the middle to help win the war, we extend our congratulations. The part you are playing in the victory program deserves the highest praise. Without your expert supervision, untiring efforts and the fine performance of your excavating and material handling machines, plans for an early victory could not materialize. No doubt, you are pushing your cranes, draglines and shovels to the limit, and in the rush to get things done faster, you may be neglecting to give your equipment the kind of attention it deserves. If this is the case, we urge you to take time out every day to inspect and service your machines. When new equipment is as difficult to get as it is today, it is doubly important that you take unusual care of what you have. Make it a 1943 resolution to do everything that you can to make your present equipment last longer—you will be doing yourself and country a big service.

**AN IMPORTANT
LINK IN THE
Victory
PROGRAM**

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division

LIMA, OHIO

NEW YORK, N. Y.

PHILADELPHIA, PA.

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MINNEAPOLIS, MINN.

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MONTREAL, QUEBEC, CANADA

★ BUY WAR BONDS AND STAMPS



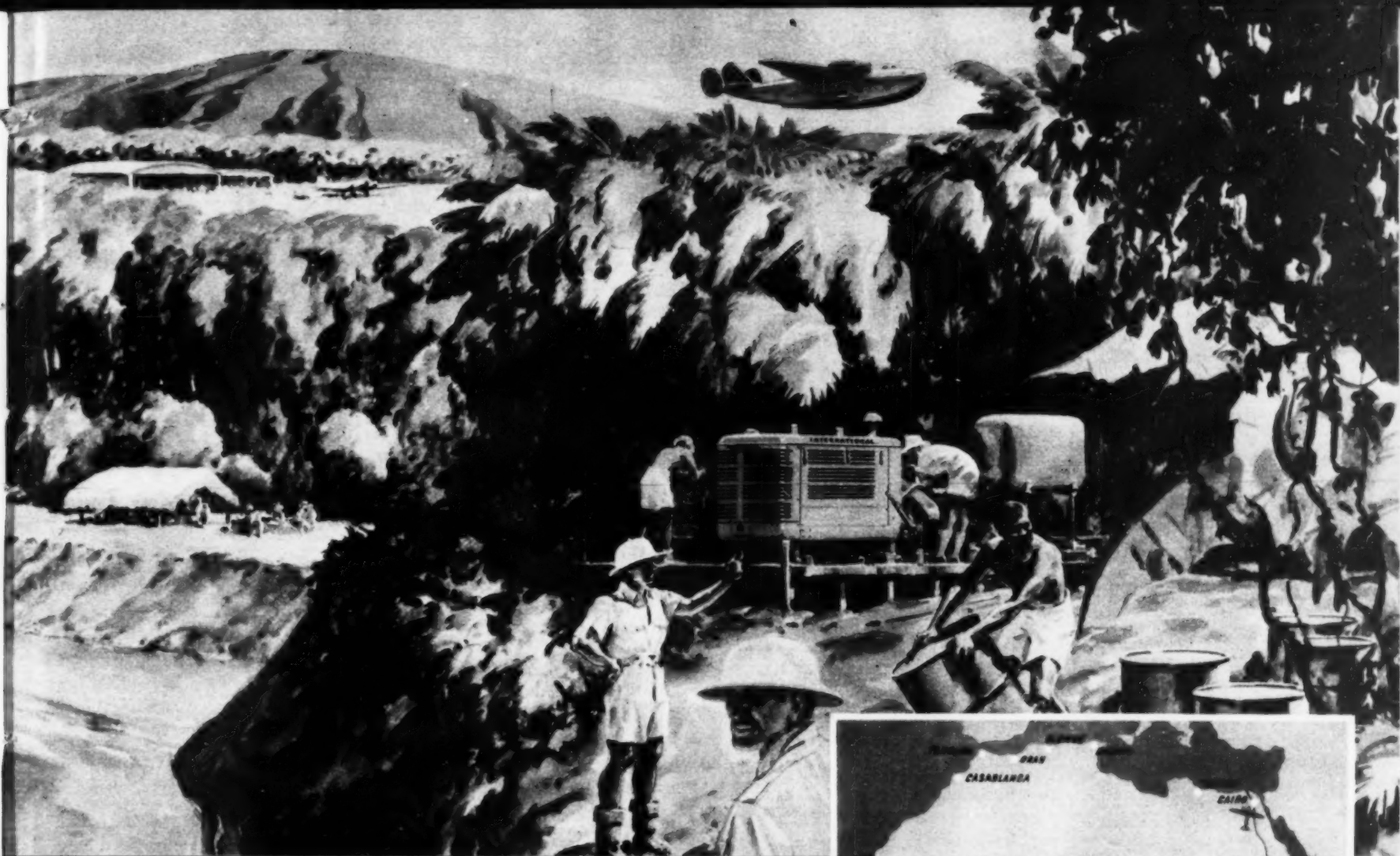
Write for a copy of "Timely Tips", a booklet full of information to help your operator get better and longer service from his machine.

LIMA

CRANES, 13 TONS TO 65 TONS

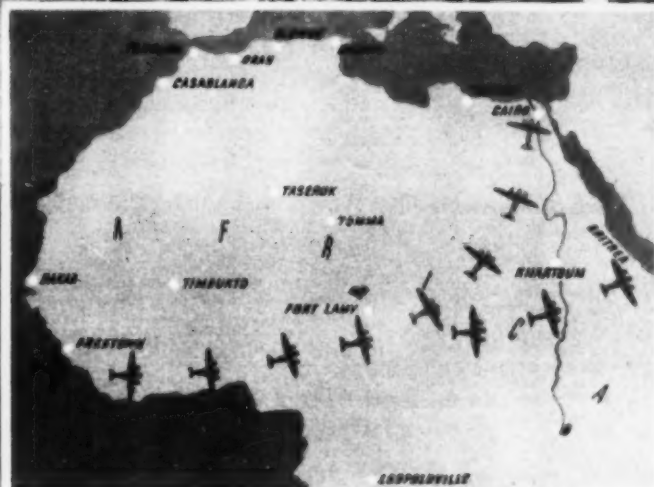
SHOVELS, ¼ YD. TO 3½ YD.

DRAGLINES, VARIABLE



SKYWAY TO THE BATTLE FRONTS!

International Diesel Power
serves Pan American across Africa



"PLENTY AND ON TIME!" With breathtaking speed Pan American Airways built the now-famous South Atlantic and African aerial life line for the Air Transport Command. The operation is a transportation miracle of the war.

In just 61 days, on Presidential order, Pan American got this new trans-hemisphere transport service in action, with planes winging across a vast expanse of ocean, jungle, and desert.

Aboard the Clippers speeding out from the American terminals are ever-mounting loads of war-vital men and materials . . . for the fighting fronts in Africa, in Russia and India, in China and the Pacific.

The forging of the vital chain of aerial bases to complete the routes across nearly 18,000 miles of land and sea will stand forever as one of the most inspiring chap-

ters in aviation history.

It involved organizing a technical army of more than a thousand men, assembling a veritable mountain of materials, then transporting and spreading them over a route encircling half the globe. It meant anchoring marine and land bases in trackless territories. It meant coping with health hazards, braving submarine and aerial attack, and operating ferrying services that pressed on the heels of construction.

With the expert authority of the Air Transport Command and the unstinted cooperation of American manufacturers, the job was swiftly done. The way lay clear to great events. . . . *Here, as all the world knows, was a route destined to play hob with Axis strategy!*

Says an Executive of Pan American: "One might call the International Power Units the 'hearts' of our stations in Africa. We depend on the power from these plants for the lighting of buildings, shops and airports; the operation of pumps for the water supply systems; refrigeration of meats and other food supplies; electric ranges for cooking; ventilating fans; air conditioning units; laundry machinery; shop tools and equipment; the heating of water, and other miscellaneous uses."

INTERNATIONAL HARVESTER is proud of the part played by International Diesel Units on the Pan American route to the Middle East and the Orient.

On many another life line in the global war, International Crawler Tractors and Power Units, and thousands of International Trucks, speed the way to battle. Like all International Harvester Products, known the world over, today they are devoted to war—dedicated to Victory.

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue

Chicago, Illinois

INTERNATIONAL HARVESTER

BUY
U.S. WAR
BONDS

POWER FOR VICTORY

BUY
U.S. WAR
BONDS

NON-DAMAGING TO LOADS!

... are Macwhyte Atlas Slings, which also give you these PLUS advantages:

- Unquestioned safety
- Light-weight, flexible, easy to handle
- Positively NON-SPINNING
- Kink-resistant
- Patented construction of LEFT-&-RIGHT LAY ropes
- Store in small space
- No splices to wicker
- Terminate in natural loop-ends
- L-O-W final cost

"Keep 'em rolling . . . but do it with SAFETY to the load!"

This well describes the service of Macwhyte Atlas Slings, made from BOTH left-lay and right-lay endless wire ropes. For these slings have an unusual body which spreads slightly at point of contact with the load.

This special body construction guards against load slipping, against load damage, against scratching and scuffing in transit. It holds the load in a sure, safe grip!

On land, on sea, and on our aircraft, Macwhyte Atlas Slings are doing their job to help speed loads with SAFETY . . . and they're doing it in plants all over America.

Whether or not you feel you're handling loads with maximum speed and safety, send for helpful rigging bulletins. Write us on company letterhead. Find out how others are getting the job done faster, without danger of damage.

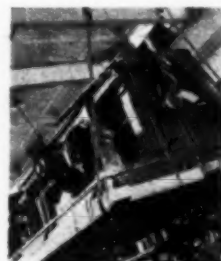
MACWHYTE COMPANY 2941 Fourteenth Avenue, Kenosha, Wisconsin
Manufacturers of wire rope to meet every need—Left-&-Right Lay Braided Slings—Stainless Steel Wire Rope—Monel Metal Wire Rope—Aircraft Cable, Aircraft Tie-Rods, and "Safe-Lock" Swaged Terminals
Mill Depots: New York · Pittsburgh · Chicago · Ft. Worth · Portland · Seattle · San Francisco
Distributors throughout the U. S. A.

MACWHYTE ATLAS BRAIDED SLINGS

Safety PLUS Performance



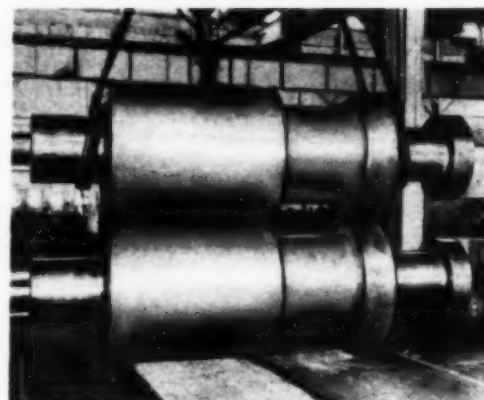
Handling Ship Propellers



Handling Lock Gates



Handling Machinery



Handling Steel Mill Rolls

This is the sling situation today . . .

Demand • Macwhyte Atlas Braided Wire Rope Slings are in greater demand today than ever before. Because they are specially made to move loads fast AND safely, they are widely used to speed production of war materials . . . tanks, guns, planes, ship parts, etc.

Supply • By increasing plant capacity, our plant personnel, and by working night and day, we have been able to assure reasonable delivery of slings on orders when no fittings are required.

Time and materials are vital. On sling problems, consult Macwhyte. Save both time and materials.

Sling Fittings • Thimbles, links, open and closed sockets, hooks, turnbuckles, etc., will in most cases outwear sling bodies several times. Save these fittings. They are difficult to obtain. Transfer them (we'll do it for you) from a used sling assembly to a new sling assembly. Just remember that it takes an AA-1 rating for delivery of many fittings such as those mentioned above.

Consult with us • Time is VITAL. Help save YOURS by taking advantage of

OUR sling experience. You know what work you want the slings to do; we can tell you, from years of experience, the sling design best suited for that job. Before taking time to design the sling yourself, why not consult with our engineers? They can simplify the sling equipment needed, make every inch of steel give MAXIMUM service. That's what YOU want. That's what YOUR COUNTRY asks.

"Awarded for outstanding achievement to the men and women of Macwhyte Company."



Time is short!



save it!

LET'S have no more "Too Little—Too Late". Every yard of material to be moved in the construction of vital airports, depots, cantonments and ordnance plants *must* be moved in the fastest possible time. Contractors who know costs as well as performance will choose LaPlant-Choate earthmoving equipment for time-saving work on their jobs. These machines are doing, every day, more and better work for their owners in the war effort—and they're doing it *faster*.

Owners have learned to expect great things from LaPlant-Choate tools. They bought quality manufacture—good service and long life. They can continue to expect the same service and long life from these fine tools. A great organization of LaPlant-Choate Distributors backs up these scrapers in the field!

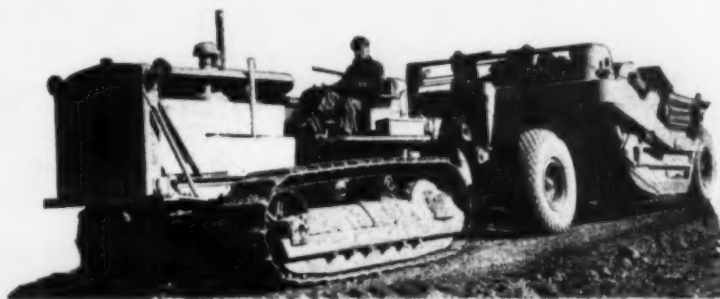
EARTHMOVING—Hydraulic and Cable Scrapers, Trailbuilders, Bulldozers, and Scraper Pushers, Tampers and Cable Rippers.

LAND CLEARING — Hydraulic Treedozer, Brushcutters, Root Cutters, Brush Rakes, Stinger Blades, Weed Eradicators, Stump Splitters.

Your distributor of these rugged machines is fully equipped, and has skilled workmen, ready to help you keep your machines working—efficiently working so that you can expect maximum performance with a *minimum of lost time*. He'll keep your equipment working to help our country through this crisis!

"TOP THAT 10% BY NEW YEAR'S"

Our Government is asking all of us to save regularly at least 10% of our income by the New Year. Sign up today!



LAPLANT-CHOATE

Factory & Home Office
Cedar Rapids, Iowa

Manufacturing Co. INC.

Pacific Coast Office
San Leandro, Cal.

EARTH MOVING - LAND CLEARING - SNOW REMOVAL EQUIPMENT

To Prolong Rope

MAKERS STRESS LUBRICATION

WIRE ROPE manufacturers without exception, stress lubrication as the No. 1 war measure to lengthen rope life, save steel, maintain vital construction schedules. Everywhere, wire rope users are following this advice, and prolonging rope life with *Texaco Crater*.

Texaco Crater penetrates to the very core of wire rope, sealing each wire in a tough, viscous film that reduces internal friction and wear, keeps out moisture, prevents corrosion, makes ropes last longer.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred on important construction jobs throughout the country.

These Texaco users enjoy many benefits that can be yours. A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

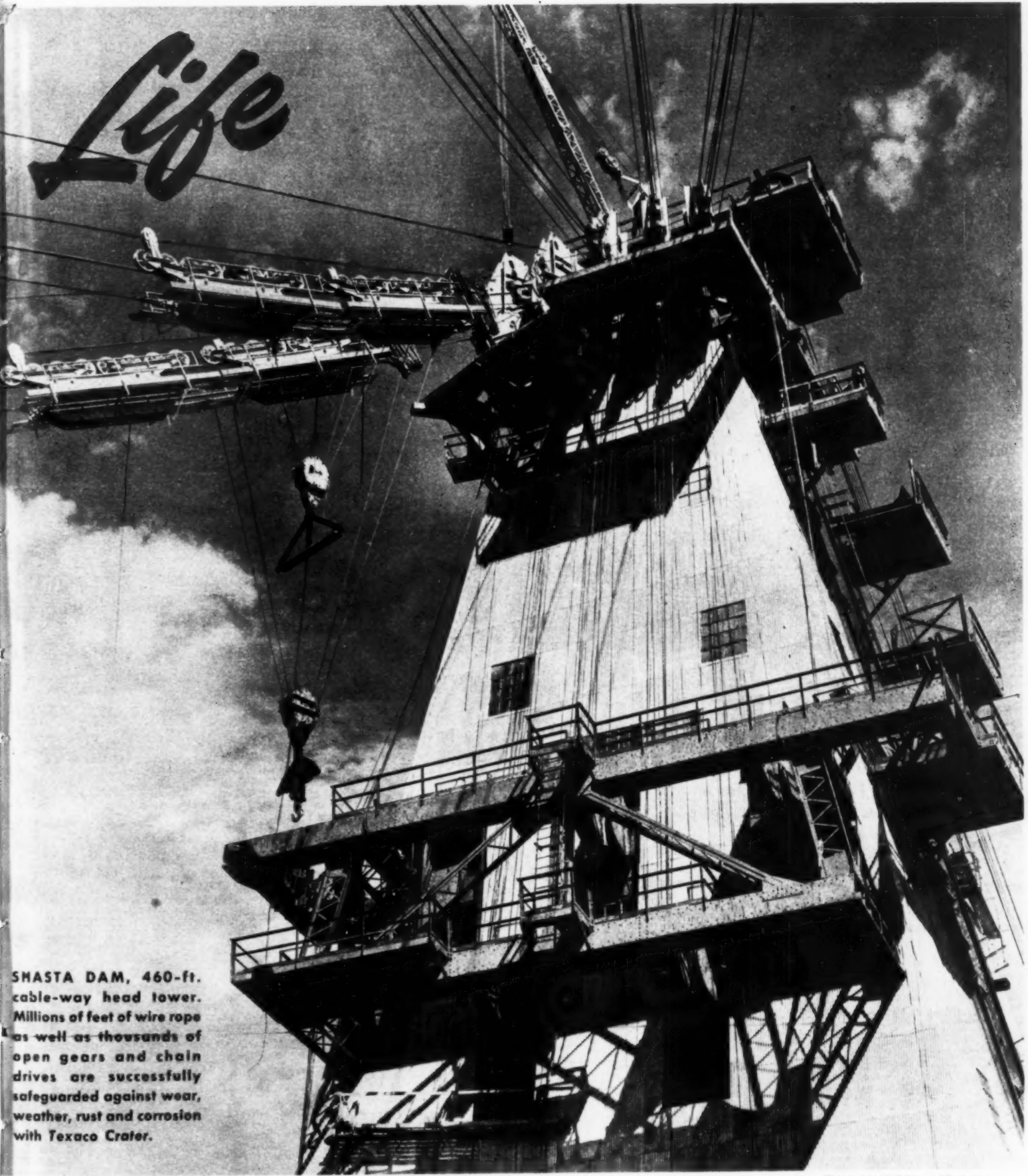
CRATER BOOKLET
yours for the asking.
32 pages telling and
showing what Crater
does and how easy it
is to use to protect wire
rope, gears and chains.



TEXACO

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS

Life



SHASTA DAM, 460-ft. cable-way head tower. Millions of feet of wire rope as well as thousands of open gears and chain drives are successfully safeguarded against wear, weather, rust and corrosion with Texaco Crater.

Photo courtesy U. S. Bureau of Reclamation

Lubricants and Fuels

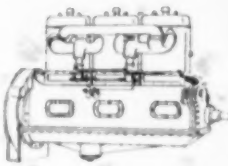


FOR ALL CONTRACTORS' EQUIPMENT

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

January 1943 — CONSTRUCTION METHODS — Page 25

Keep Your Horses Pulling on the Victory Road

You'll get the most efficient excavator performance when all the "horses" in your engine are pulling full strength. Here are a few hints that may help keep that engine humming.

- 1 Inspect engine regularly and keep it clean. 
- 2 Warm a cold engine up slowly (don't use choke more than is absolutely necessary).
- 3 Don't stop a heavily loaded engine abruptly. Let it idle a little to cool off before shutting down.
- 4 Flush radiator out whenever water gets dirty. Be sure water added is clean. Never add cold water to an overheated engine. 
- 5 Use good grade lubricating oil. (Follow manufacturer's recommendations). Clean sump and change filter element frequently (every other oil change is good practice).
- 6 Keep proper amount of water in battery. (Add water when starting, never when shutting down). Keep terminals covered with grease to avoid corrosion.
- 7 In gasoline engine, keep spark plugs and distributor points properly adjusted and clean.
- 8 In diesel engine, check injection nozzle pressures after 300 hours on a new engine, every 1500 hours thereafter. **KEEP FUEL CLEAN.** Storage tank and transfer containers or pumps should be kept free of both dirt and water.
- 9 Get complete care and maintenance instructions from manufacturer or distributor, and follow them carefully. 



Bucyrus-Erie employees have accepted the award of the Army-Navy "E" as a challenge to keep production rising. * *

Bucyrus-Erie

SOUTH MILWAUKEE • WISCONSIN • U.S.A.

Athey Forged-Trak Trailers

KEEP SUPPLIES ROLLING

Through "Impassable" Alcan Mud!



Transportation of supplies and materials in the pioneering stages of the Alaska Highway was an important phase of this miracle of highway construction.

Rolling over swampy, miry, freshly broken trails, Athey Forged-Trak Trailers served as supply trains for the construction crews. They hauled many tons of freight over sections that would have stumped other means of transportation.

Athey is proud of the part its machines played in the building of this strategic military road because both the engineers and equipment on the job have made history!

On duty on other fronts throughout the world, Athey Trailer equipment is providing reliability in hauling against the toughest kind of footing conditions. Loads roll easily on smooth steel rails—weight is evenly distributed over a broad area.

In peacetime, too, there are many difficult transportation problems that can be economically solved with the all-weather dependability of Athey Forged-Trak Trailers. Athey Truss Wheel Co., Chicago, Illinois.



"NICE GOING U.S.A."

**YOU'VE WON A BATTLE
THAT'LL HELP US WIN A WAR."**

To our armed forces everywhere, the opening of the Alaska highway is welcome news. To them it flashes, "We're On Our Way."

America is moving like a great giant, gradually working into position for the death squeeze on the Axis. The Alcan Highway takes the freedom-loving people of the world nearer to the day of Peace.

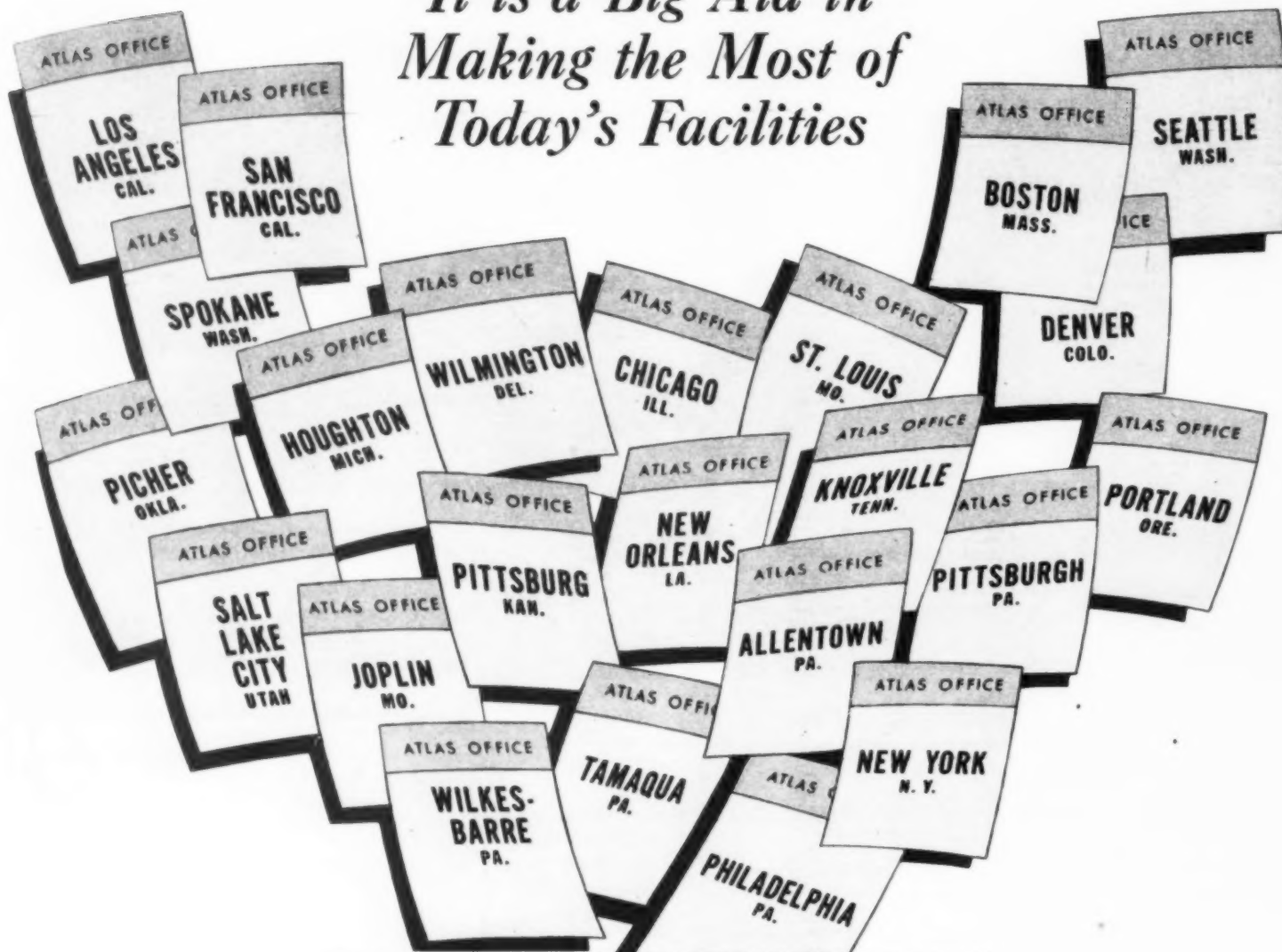
Its early completion, in spite of tremendous obstacles faced by the contractors and engineers, displayed the spirit and determination that makes America the sure winner in this global war!

Athey

FORGED-TRAK TRAILERS

When the Helping Hand is Near At Hand—

*It is a Big Aid in
Making the Most of
Today's Facilities*



ATLAS sales offices and distribution points are conveniently located throughout the country. There are ten explosives manufacturing plants located for efficient service. Atlas representatives are ready to aid in licking explosives problems, involved in construction, mining and quarrying. It is remarkable what cooperation can accomplish. Let the Atlas representative prove it to you.

ATLAS

EXPLOSIVES

"Everything for Blasting"



ATLAS POWDER COMPANY, Wilmington, Del. • Offices in principal cities • Cable Address—Atpowco

Chalk up ANOTHER ROCK SHOVEL

to make **NINE**
NORTHWESTS
for
MacDonald & Kahn
San Francisco, Calif.



ANOTHER day is coming—a day when more than ever before the quality, efficiency and output of machinery is going to determine the difference between successful and unsuccessful contracts. When that time comes and you are in the market for a Shovel, Crane or Dragline, remember that Northwest is the "Repeat Order" machine—a result of satisfactory service with scores of contractors for years.

Nine Northwests have been purchased over a period of years by MacDonald & Kahn of San Francisco, Calif. There is a testimonial that can't be equalled! Repeat orders from responsible contractors are your assurance of dependability during the emergency, and low cost operation in the future.

**NORTHWEST
ENGINEERING COMPANY**
1728 Steger Building
28 East Jackson Blvd., Chicago, Ill.

NORTHWEST

IF YOU HAVE
A REAL ROCK
SHOVEL, YOU'LL
NEVER HAVE TO
WORRY ABOUT
OUTPUT IN DIRT

FOR OUR ARMED FORCES

INDUSTRIAL AMERICA HAS PLEDGED

ALL-OUT AND EVER-INCREASING PRODUCTION

FOR OUR ARMED FORCES

-THAT THEY MAY QUICKEN THE DAY OF VICTORY

-THAT THEY MAY RETURN IN SAFETY

-AND THAT THE WORLD MAY BE ASSURED

OF A LASTING PEACE





SEE YOUR "CATERPILLAR" DEALER

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.
CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

**TO WIN THE WAR:
WORK—FIGHT—BUY WAR SAVINGS BONDS!**



KEEP 'EM WORKING!

To win the war we must all pull together.
"Caterpillar" owner, dealer and manufacturer—
each has a responsibility to the other. All three
have a responsibility to the Nation which is fight-
ing to bring us Victory.

★ ★ ★

NEARLY ALL of "Caterpillar's" production has been "drafted" for the fighting fronts. The manufacturer has no choice. The dealer has no choice. The owner has no choice. For private contracting and production work, we must face grim necessity . . . we must make the present equipment do. Yet we must—and *will*—carry on!

"Caterpillar's" responsibility to the owner and dealer is to help keep both in business. . . . To supply the parts needed to keep "Caterpillar" Diesel Tractors, Graders, Engines and Electric Sets *working*; to supply the dealer so that he may render helpful mechanical service.

The "Caterpillar" dealer's responsibility is to give the owner the full benefit of his expert knowledge and service facilities. Fortunately, all "Caterpillar" dealers are well equipped for this. Their inspection, repair and maintenance facilities are modern. Their tools are specially designed, their men factory-trained for work on "Caterpillar" Diesel equipment.

The "Caterpillar" owner's responsibility, is to himself and to his country, now at war. All the work his "Caterpillar" Diesels can perform is needed today in the war production effort. Idle machines are an aid to the enemy. The owner should have his "Caterpillar" dealer look over his equipment . . . to help in spotting trouble *before* it happens.

The owner himself knows when blades, grousers, track pins, rollers and sprockets have become worn from long or severe usage. From the same causes it may be apparent that engine power has diminished and that he is now getting considerably less of the work capacity which was originally built into these sturdy power-plants.

Other signs of needed adjustments, repairs, overhaul or parts renewals are usually less easily detected. A *service-dealer inspection pays*. DON'T PUT IT OFF. Then arrange with the dealer to fix up your "Caterpillar" Diesel units—to *keep 'em working*.

HOW LIGHT, POWERFUL

Thor AIR TOOLS

Speed All These Major Construction Jobs!

You can keep construction moving at an ever faster pace with THOR Air Tools. Basic reasons why THOR tools work harder and faster are shown in these typical examples of important construction jobs. For helpful information on the complete line of THOR Contractors Tools write for Catalog No. 42A.



★ *Faster Rock Drilling!*

Because Thor Rock Drills Have:

- Automatic valve assembly that admits exact amount of air needed for efficient operation.
- Powerful rotation provided by extra heavy rifle bar assembly.
- Cushioned steel retainer, fully enclosed and dirt-proof, absorbs drilling shock.
- Full automatic lubrication insures cool, efficient operation.
- "Swing-Feed Cylinder," on stopers, for quick change of water tubes on job.



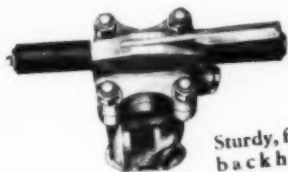
Disassembled view of Thor Short Travel Tubular Valve.

★ *Faster Demolition!*

With All These Features of
Thor Paving Breakers:



- Specially designed cylinder gives full effect to every hammer blow.
- Extra long piston hammer prevents scoring of piston and cylinder walls.
- Reversible piston for longer service life.
- Drop-forged steel backhead, extra sturdy and rigid for prying operations.
- Cool-handling rubber grips.
- Simple, efficient latch retainer for quick change of accessories.



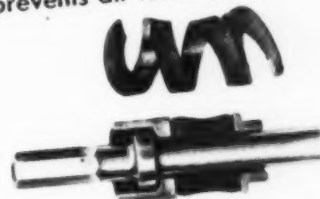
Sturdy, four bolt backhead of Thor Paving Breaker.

★ *Faster Digging!*

Thor Clay and Trench Diggers
Give You:



- Cylindrical rocker valve provides perfect sealing and control of air pressure for efficient operation.
- "Pigtail Rubber Bumper" excludes dirt, absorbs vibration.
- Self-seating throttle valve insures "full on" and "full off," prevents air leakage.

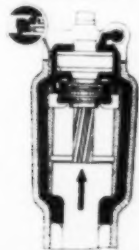


Thor Pigtail Rubber Bumper, assembled and disassembled.

Thor SHORT TRAVEL, TUBULAR -VALVE BOOSTS OUTPUT, SPEEDS WORK

An Exclusive Feature of
Thor Air Tools

The Thor Short Travel, Tubular Valve, operating with split second accuracy, exactly measures the quantity of air admitted through openings held to a tolerance of .00025 of an inch. Because of perfect timing the exhaust port is always cut off before the valve opens. No air is wasted. The rapid action enables Thor tools to get the maximum power from every foot of air.



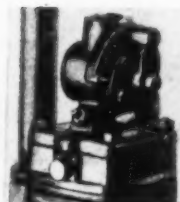
Sectional drawing of Thor Short Travel Tubular Valve.

★ *Faster Pumping*

With Thor Sump Pumps
You Get:



- Air tight housing that enables motor to operate partially or fully submerged.
- Adjustable throttle varies capacity and speed to needs of job.
- Automatic lubrication keeps all moving parts fully lubricated.
- New design exhaust outlet greatly cuts chance of freezing.



Variable Speed Control on Thor Sump Pump.

THOR AIR TOOLS FOR CONTRACTORS

SINKER ROCK DRILLS • STOPPER ROCK DRILLS • DRIFTER
ROCK DRILLS • PAVING BREAKERS • CLAY AND TRENCH
DIGGERS • TAMPERS • SUMP PUMPS • SAWS • GRINDERS

Thor

Portable Pneumatic and Electric Tools

INDEPENDENT PNEUMATIC TOOL COMPANY



600 W. JACKSON BOULEVARD, CHICAGO, ILL.
Branches in Principal Cities



A quick look backward . . . behind the fighting front

Having been at war a year, let's grant ourselves a moment of reminiscence now.

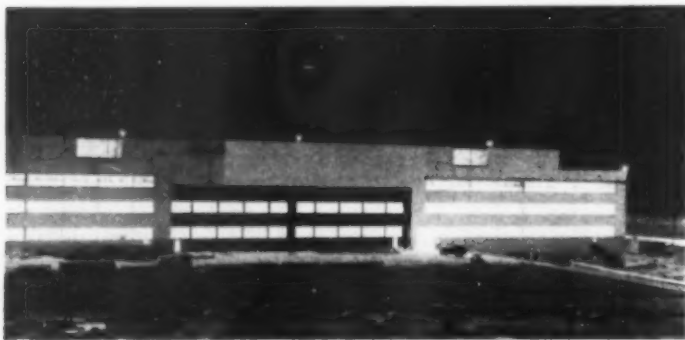
We started from scratch. We had to switch to a war program overnight. To tanks instead of pleasure cars; to guns instead of radios—that sort of thing.



Building an African flying field.

Without forgetting that hard days are still ahead, let's take a brief time-out to appreciate the fine fact that we've done pretty well.

In this progress, new construction has played a part for which there could be no substitute—armament plants, army camps, navy bases, flying fields, emergency housing—with U. S. contractors supplying the vital construction “know-how” with speed and skill.



A fighter plane plant, Eastern U. S.

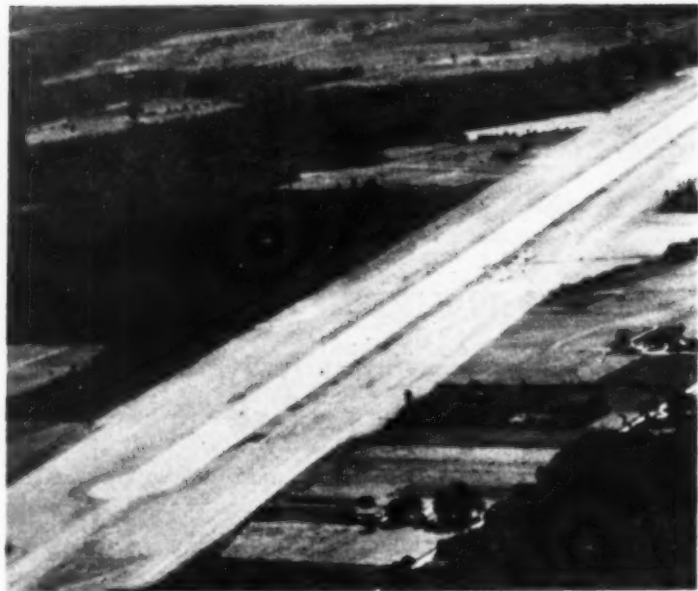
We of Lehigh are glad that, in all this war-born construction Lehigh Cement found a useful place . . . that it needed no time-consuming “conversion”



Naval Training Station expands.

. . . that its concrete was often able to replace critical steel . . . and that, whenever speed was all-important, Lehigh's Early Strength Cement was available to make service-strength concrete in 1/3 to 1/5 the usual time.

Now that winter is here, this latter point becomes more important still. For with Lehigh Early Strength Cement you can get your winter concrete at summer



The country's first emergency landing strip

speed—with danger of frost damage *lessened*, with heat-protection time and cost *reduced*.

Why not ask the Lehigh Service Department to send you, free, its data on recommended practice for cold weather concreting with Lehigh Early Strength Cement? Any inquiry will be promptly answered.

Lehigh CEMENT

LEHIGH PORTLAND CEMENT COMPANY
ALLENTOWN, PA. CHICAGO, ILL. SPOKANE, WASH.

Move More Yardage Faster & at Less Cost with TOURNAPULLS



You'll Need Fewer Units . . . Same Time Will Save Manpower and Steel for VICTORY

Tournapulls are quickly pushed, loaded, haul up to 14.3 m.p.h., and spread their own loads. You get plenty of tractive power, too—Tournapull weight (plus 40% of the Carryall and its load) is centered on the drive wheels. That means surplus rimpull for quick acceleration to top speed or for pulling through tough spots.

Load, Haul, Spread—One Continuous Cycle

With Tournapulls you get tractor-

scraper digging and spreading efficiency plus truck hauling speeds. You eliminate such one-purpose tools as shovels and elevating graders for loading, trucks for long hauls, and special spreading tools on the fill.

Result: You cut equipment investment almost in half, require fewer operators, move more yardage (see chart), move it faster, at less cost and with less steel.

Haul One Way	98 H.P. Model C (11 yards heaped)		150 H.P. Super C (15 yards heaped)	
	Trips	Pay Yards	Trips	Pay Yards
600'	17.1	150	15.0	180
1200'	14.0	119	12.0	144
1600'	12.3	104	10.7	129
2000'	10.9	93	9.7	116
3000'	8.4	71	7.6	91
5000'	5.8	50	5.4	65

These figures are based on a 60-minute hour, loading common earth on the level with a "Caterpillar" D8 pusher and hauling over good roads.

One of a fleet of 14 Super C Tournapulls speeding a Midwestern glider base for Uncle Sam. Contractor is long-time LeTourneau fleet-user J. A. Terling and Sons. Also on this job are 5 LeTourneau Dozers and 10 Model R Carryall Scrapers.

Saves Freight Between Jobs

When Frank Mashuda got ready to move 7 Super C Tournapulls from an airport job at Pittsburgh, Pa., to Madison, Wisconsin, he decided travel by highway would save both freight and delivery time. It did.

The Tournapull caravan (below) left Pittsburgh on a Friday noon, laid over in Fort Wayne on Sunday, yet pulled into Madison Tuesday evening. The boys travelled only during daylight hours, spent about 50 hours driving, used approximately 700 gallons of fuel for the 7 units, an average of 6 miles to the gallon.

Figuring all costs—fuel, operator wages and travel expenses—it's estimated highway travel cut freight costs almost in half.

Tournapull speed and big pneumatic tires made possible this quick, money-saving trip. You, too, can travel from job to job easily and quickly via highway when you use Tournapulls for earthmoving.

What About Tournapull Deliveries?

We'll be honest with you. We've got plenty of Tournapull orders on our books. However, a few Tournapulls are available for release through WPB. Remember, on such jobs Tournapulls: (1) conserve manpower, (2) save steel, (3) speed construction, (4) lower your costs. Ask your LeTourneau "Caterpillar" distributor NOW for details on Tournapull deliveries and performance.

LETOURNEAU

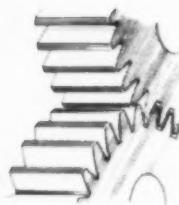
PEORIA, ILLINOIS • STOCKTON, CALIF.

Manufacturers of DOZERS, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS* SHEEP'S FOOT ROLLERS, TOURNAPULLS*, TOURNAROPS*, TOURNATRAILERS*, TOURNAWELDS*, TRACTOR CRANES.

*Name Reg. U.S. Pat. Off.



SPEEDS WAR PRODUCTION EVERYWHERE



MACHINE PARTS ARE HARD TO GET

You can help make the machinery you now operate last much longer without trouble, delay and expense of repairs and replacements, by using Lubriplate lubricants.

Reports from industry everywhere are telling how Lubriplate lubricants are helping to prevent shut downs and repairs. Some of these stories are almost beyond belief.

Everyone engaged in war production owes it to his Government . . . owes it to himself . . . to see what Lubriplate lubricants will do to increase his production. Lubriplate is different. It is not to be compared with ordinary oils and greases. Lubriplate arrests progressive wear. It protects machine parts against rust and corrosion. It maintains a wear-resisting protective film on bearing surfaces. There are Lubriplate lubricants to meet all oper-

ating requirements, high and low temperatures, and in the presence of water and steam. Even under certain chemical conditions Lubriplate is performing in a manner that would be impossible with most conventional lubricants. Lubriplate outlasts ordinary lubricants many times, therefore it is extremely economical.

In these war days when production is vital and machine replacement parts are hard, or, impossible to get, Lubriplate lubricants will materially help keep machines running efficiently and at reduced power consumption. Write today for copy of "The Lubriplate Film" containing much valuable information.

ON GUARD



AGAINST FRICTION

LUBRIPLATE DIVISION

FISKE BROTHERS REFINING COMPANY

NEWARK, N. J.

SINCE 1870

TOLEDO, O.

WRITE FOR THE NAME OF THE DEALER NEAR YOU

You Can Depend on Your JAEGER Distributor

IN STOCK:
JAEGER SPEEDLINE
MIXERS with Machined Steel
Drum Tracks, Automotive
Type Transmission—to
Mix Faster, Run
Quieter, Longer.

IN STOCK: JAEGER
"SURE-PRIME" PUMPS
—the Pumps that Give You **CERTIFIED**
HIGH PERFORMANCE . . . Every Unit
Individually Factory Tested . . . Sizes to
Meet Your Need.

for EQUIPMENT
REPAIR PARTS

for SERVICE

FOR IMPORTANT PAVING JOBS:
SCREW SPREADERS and **TYPE "H" FINISHERS**
—the Method Which Made Today's
Pace Possible on Airports and Strategic
Roads.

More Than 100 Service and Supply Stations—as Close as Your Telephone:

Wherever important construction and paving work are being done today, there is a Jaeger distributor close by—with the experience, the equipment and the organization to help you lay out and equip your job and keep your equipment rolling.

Complete Stocks of Parts—on hand to save you costly lay-ups and delays.

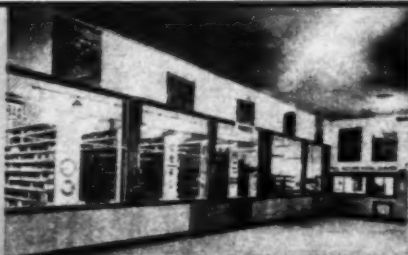
Trained Mechanics, with factory shop facilities to check, repair and keep your equipment working efficiently.

Stocks of Jaeger Pumps and Mixers, for sale or rent, in many sizes.

Direct Help on Your Paving Problems: Men who know today's methods and machinery and the local conditions will help you to lay out your job and meet your schedules. Jaeger traveling engineers are also available for special problems of spreading and finishing airports or strategic pavements, both concrete and bituminous.

THE JAEGER MACHINE COMPANY, 800 Dublin Ave., Columbus, Ohio

THOUSANDS OF REPAIR PARTS for Major Items of Contractors' Equipment are Quickly Available to You from Our Distributors' Stocks.



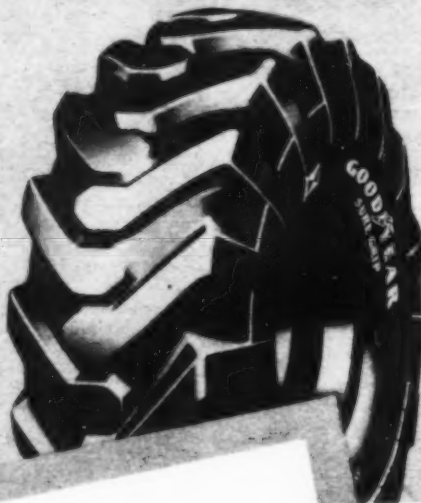
MECHANICS WHO "KNOW THEIR STUFF" You will find Jaeger distributors outstanding in the caliber of their service organizations and shop facilities.



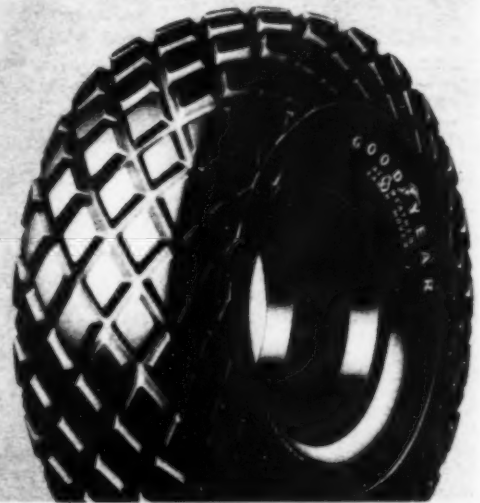
For all rock work
GOODYEAR
HARD ROCK LUG



For mud and marsh
GOODYEAR
SURE-GRIP GRADER



For drawn dirt-movers
GOODYEAR
ALL-WEATHER EARTH MOVER



Here's the
EXTRA MILEAGE
line-up for '43



All-Weather, Supertwist—T. M. © The Goodyear Tire & Rubber Company

THE rubber shortage makes it more important than ever that when you can get tires, you get Goodyears.

The tire-building "know how," that has made Goodyear truck tires the world's first choice for more than twenty years, means a dollars-and-cents difference to you now in longer wear.

For all Goodyear off-the-road tires have Goodyear's multiple-compounded construction and low stretch Supertwist cord carcass—two features that endow them with greater ability to take it.

Goodyears are built in special tread designs for various types of work—rock, mud and sand—to give you greater traction, more speed and pull.

And all Goodyears are built with the maximum amount of new live rubber allowed by government specifications for tires to be used on essential war-time construction projects.

Get Goodyears on your tire certificates and see for yourself why it is true: **"MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND!"**

GOODYEAR
THE GREATEST NAME IN RUBBER

WORTH ITS WEIGHT IN GOLD —
Send for free copy

This Goodyear Off-The-Road Tire manual is packed with information on proper care and maintenance of tires that insure longer wear—save you money. Every contractor should have this complete service handbook. To get your free copy write Goodyear, Dept. SP, Akron, Ohio



Goodyear's new sound slide film on Truck Tire Conservation is available for showings to group meetings of your drivers and maintenance men. Your Goodyear dealer or service store will be pleased to show it to your employees—just ask about it.

Construction Methods

ROBERT K. TOMLIN, Editor

Volume 25

JANUARY, 1943

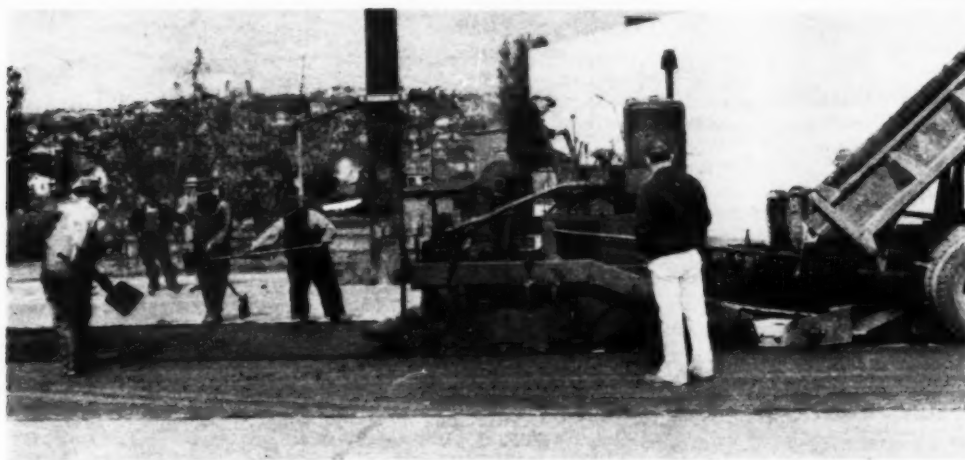
Number 1

Paved Median Strip

**Replaces
Street-Car Tracks
in Seattle**



ASPHALTIC CONCRETE MIX is delivered to traveling spreading and finishing machine for application to median strip from which street-car tracks were removed.



SPREADING OF SURFACE COURSE (left) is done by machine that also levels and tamps into place bituminous mix.

ONE OF THE ITEMS in Seattle's improvement and betterment program in which some 17 mi. of streets received a 60,000-ton output of the municipal paving plant, is a median strip consisting of two new 9-ft. traffic lanes added to Nickerson Ave. which leads to the Ballard docks and Lake Union shipping centers. These new lanes replace street-car tracks removed some time ago, leaving an unused 18-ft. strip in a 44-ft. street. The program was to clean out this strip, roll the subgrade with an 8-ton roller and then backfill with pit-run sand and gravel, followed by 2 in. of asphaltic concrete thickened at the edges to 4 in. A 70-80 penetration asphalt was used, mixed and placed by city forces employing a Barber-Greene spreader-finisher. E. L. Wartelle, city engineer of Seattle, Wash., and Ed Dunlap superintendent of paving, were in charge of the street improvement project.



ROLLER COMPACTS PAVING (below) in one of two new 9-ft. traffic lanes created by removal of street-car tracks.



THROUGH DENSE NEW GUINEA JUNGLE United States troops of Gen. Douglas MacArthur's Southwest Pacific command hack their way to build road for army "jeeps" and other vehicles from native village where temporary quarters have been set up.

Press Association Photo



AT KESWICK DAM. U. S. Bureau of Reclamation project on Sacramento River in California, construction is carried on by Atkinson-Kier Co. under War Production Board order specifying certain facilities of Central Valley project to be completed as part of war program. Dam will regulate variable water releases coming from huge Shasta Dam power plant 9 mi. upstream. Concrete placing in 5-ft lifts is done by 1,400-ft. cableway handling 4-cu. yd. buckets. Keswick Dam will be 125 ft. high and 800 ft. long and will comprise three main sections: Powerhouse, fish trap, and spillway.

EIGHTY ACRES OF ROOF (below) consisting of 38-ft. span thin multiple concrete arches are required to cover main building of huge defense plant designed by Albert Kahn Associated Architects and Engineers of Detroit, and under construction for Chrysler Corp., by George A. Fuller Co., of New York, general contractor. Project is financed by Defense Plant Corp. Change of preliminary design from steel to concrete effected a big saving in critical material. Arch slab concrete is only 3 in. thick and is reinforced with single layer of 4x4-in. wire mesh. Arches, poured in 30-ft. lengths, are stiffened by concrete ribs at columns and at center of each bay.

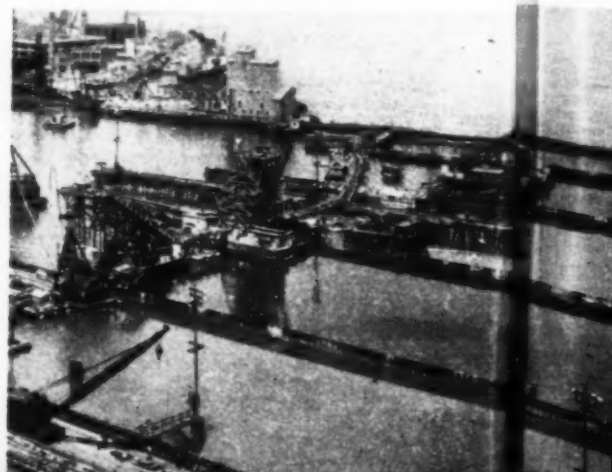
THIS MONTH'S NEWS REEL



LAST POUR OF CONCRETE at Grand Coulee Dam, U. S. Bureau of Reclamation project in California, is made late in November by Consolidated Builders, Inc., organization of contractors formed by Henry J. Kaiser of ship-building fame, which has been engaged on project for 4½ years. More than 6,000,000 cu. yd. of concrete have been placed in dam. In one month record pour of 536,264 cu. yd. of concrete was established, equivalent to rate of 1 cu. yd. every 5 sec.



Acme Photo





WORLD'S RECORD SHIPBUILDING PACE (right) made possible by prelabrication methods, is set at West Coast Yard of Henry J. Kaiser organization when 10,500-ton steel Liberty freighter, Robert E. Peary, is launched Nov. 12, only 4 days, 15 hr., 26 min. after keel was laid. This photograph shows first stage of construction, as three bottom shell sections are welded by night crew. Large sections of hull were fabricated on open assembly tables and hoisted by cranes into place on launching ways. Construction personnel comprised 200 crafts and completed hull required 250,000 individual items. Seventeen banks of welding machines were used on each side of hull. Of total footage of welding required, 152,000 ft. were completed on assembly table and 57,800 ft. on the ways.

Wide World Photo



LABOR LEADERS reopen peace talks Dec. 1 in Washington, D. C., in effort to bring rival A. F. of L. and C. I. O. organizations together in unified movement for war effort. Three representatives from each of two labor organizations are, left to right: Representing C. I. O., are: R. J. THOMAS, of Automobile Workers, JULIUS EMSPAK, of Electricians; and PHILIP MURRAY, of Steel Workers. Representing A. F. of L. are: H. C. BATES, of Bricklayers, WILLIAM HUTCHESON, of Carpenters, and DANIEL J. TOBIN, of Teamsters



EASTERN SECTION OF EMERGENCY OIL PIPE LINE, which will link Texas with Eastern Seaboard via Illinois, gets under way in vicinity of Lancaster, Pa., as big trenching machine makes cut for laying 24-in. diameter pipe sections.

Wide World Photo

TWIN DRYDOCKS (below) for building and safe launching of ships at Eastern navy yard are built under water in dredged basin with tremie-placed concrete totaling 500,000-cu.yd. over area of 10 acres. Concrete was delivered from central mixing plant to tremie barges by pumping through pipe lines of 1,100 ft. maximum length to form bottom of structure which is slab 20 ft. thick supported by hundreds of heavy 12x12-in. H-piles.

BRIDGING A GAP TO BUNA AND GONA (below) in New Guinea are these combined American and Australian Engineer troops, under Gen. Douglas MacArthur. Trees are felled along route to provide material for structure on road leading to advanced base.

Press Association Photo



How Nation's War Needs



FOUR-LANE PAVED ROAD carrying workers to and from \$100,000,000 Indiana and Hoosier Ordnance Plants in 14,000 vehicles daily replaces two-lane road which served traffic of only 700 vehicles daily in peace time. New, widened route, with central traffic-separating strip between pairs of concrete-paved lanes, is 11.5 mi. long.

Are Served by Constructing ACCESS ROADS

MEETING THE NEEDS OF HIGHWAY TRANSPORT for war purposes has been the only objective of the Public Roads Administration of the Federal Works Agency during the last year. With the beginning of war in December, 1941, approval of highway projects was restricted to those essential in carrying on the war as certified by the War or Navy Departments. Later the War Production Board was included as a certifying agency.

All resources have been applied to the war effort. In so doing the organization did not seek to build all roads that might in some degree be helpful in carrying on the war, but rather it undertook to aid in the solution of critical highway

By R. E. ROYALL

Senior Highway Engineer

Public Roads Administration

Federal Works Agency, Washington, D. C.

transportation problems as determined in conference with federal war agencies and from the viewpoint of the best use of total resources in winning the war.

The most important phase of the work has been removal of highway bottlenecks at camps, munitions plants and shipyards. Some work has been necessary on main through high-

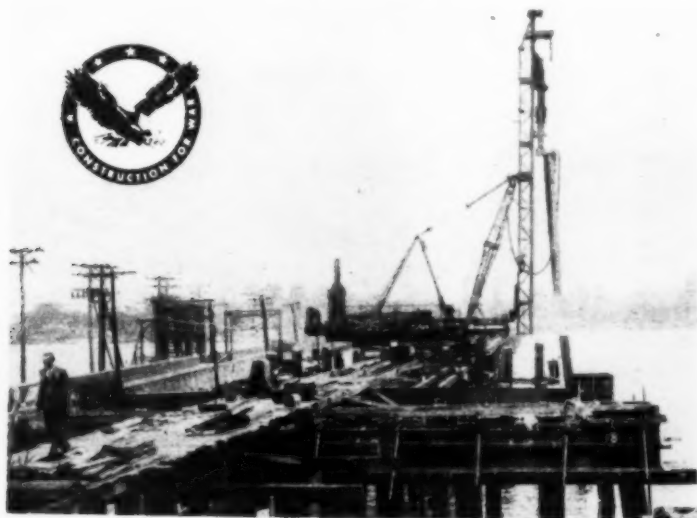


WHY NEW ACCESS ROADS ARE NEEDED. Traffic congestion became severe on this old road leading to Willow Run Bomber Plant in Michigan. It has been superseded by modern, multiple-lane concrete-paved express highway, illustrated in another photograph.



TRI-LEVEL GRADE SEPARATION is unusual structure on express highway approach to Willow Run Bomber Plant in Michigan. Construction was complicated by curvature of two upper roadway levels, combined with superelevation.

TO TRANSPORT AIRCRAFT WORKERS (below) by thousands across Back River on most direct approach to Glen C. Martin plant near Baltimore, Md., wide new bridge is built to replace inadequate narrow structure at left.



EXPRESS HIGHWAY is built to serve Ford's huge Willow Run Bomber Plant in Michigan. About 74 percent of engineering staff of Michigan State Highway Department was assigned to rush this project to completion. Road on which construction is here shown in progress serves as approach to unusual tri-level grade separation illustrated in another photograph.



EXTENSIVE CRIBBING is required to prevent slides on road serving airport on Pacific Coast.

ACCESS TO FORT LEWIS (below), army center in Washington, is provided by new road being graded by 1½-yd. power shovel, here shown uprooting large fir tree stump.



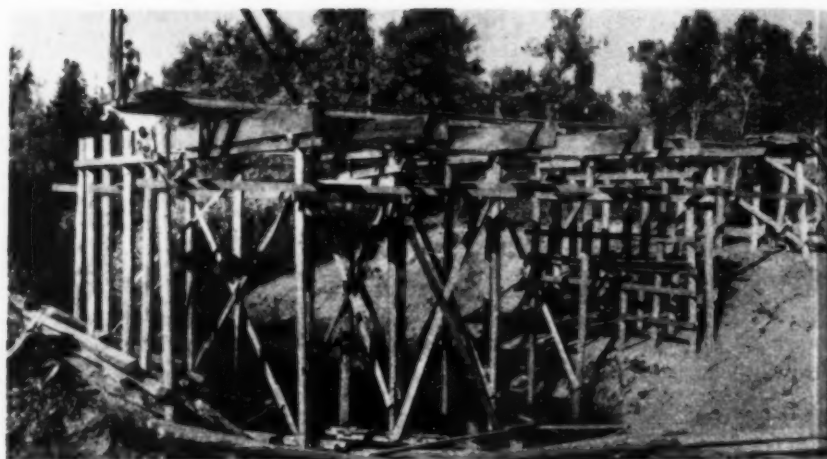
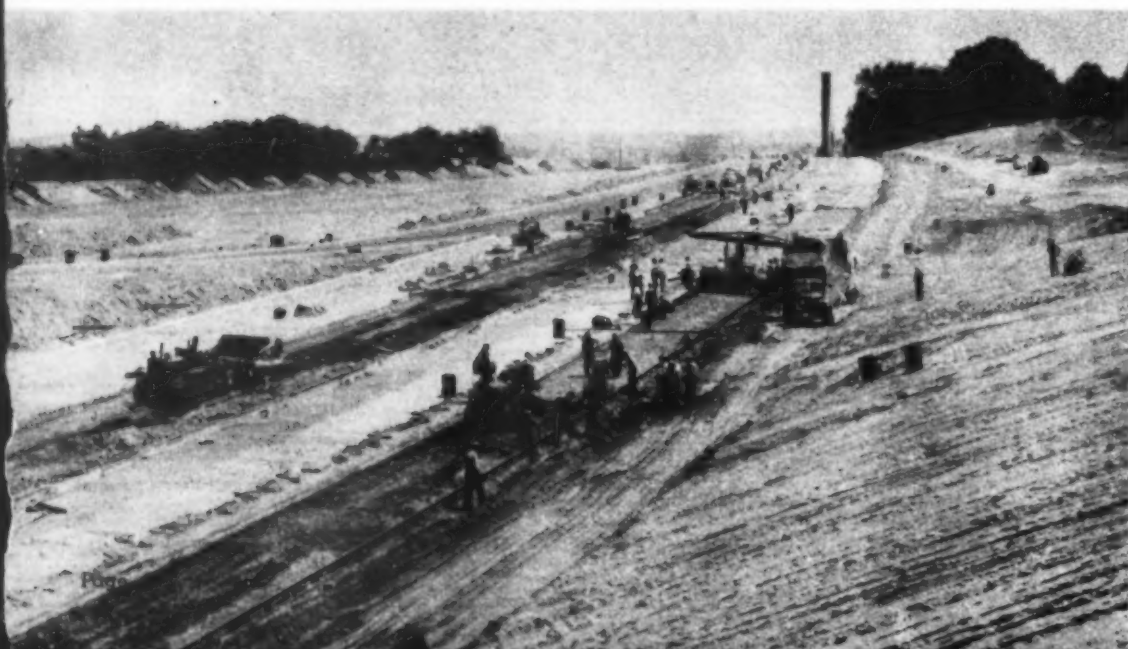


ON SUBSTRUCTURE for tri-level grade separation bridge on express highway to Willow Run Bomber Plant in Michigan draglines excavate material and forms are set for concrete piers.



RAW MATERIALS SOURCES are tapped by newly built access roads. Here is haulage route hurriedly constructed in Oregon with bulldozers to permit immediate transport of urgently needed chrome ore.

NEW WAR DEPARTMENT BUILDING in Arlington, Va., is rendered accessible from Washington, D. C., by new main route (**below, left**) built in 12-ft. wide multiple lanes of concrete colored with lamp black.



PILES ARE DRIVEN to support 69-ft. timber truss on access road to Camp Adair, Oregon. In place on falsework are 14x32-in. floor beams.

ways. Deficiencies on these routes that dam back the flow of war materials and necessities of life for war workers are of critical importance. It is estimated that 51 billion ton-miles of freight were hauled on rural highways in 1942. Major obstacles to that movement would have been felt in the war effort and improvements have been made where a serious detrimental effect on war transport has been clearly demonstrated.

However, construction of access roads to hundreds of war industries and military and naval establishments has overshadowed all other work of the year. The need for access roads appeared in 1940 as the clouds of war gathered rapidly on the horizon. Available federal-aid funds were used to meet the need to the extent possible under the laws authorizing federal aid. Since most of the needed roads were not on the federal-aid system, they were not eligible for improvement with available funds.

In spite of this limitation, necessary steps toward construction were being taken. Early in 1940 studies had been begun in cooperation with the General Staff of the War Department of required improvements to give access to military reservations. A list of 200 military areas was furnished by the War Department and after conferences engineering standards were established upon which estimated costs could be based.

Field studies were made by Public Roads Administration engineers, usually accompanied by local War Department and state highway department representatives, to determine the location, type and cost of needed improvements. Following a decision as to type and general location, arrangements were





"VICTORY" BRIDGE RAIL of non-critical materials is used on structure in Ohio. Between permanent concrete posts are temporary wood panels to be replaced after war when steel is available.

made with state highway departments for making of surveys and preparation of plans.

As danger of war became more imminent, the Navy Department and the Advisory Commission to the Council of National Defense requested similar studies for naval areas and war industries.

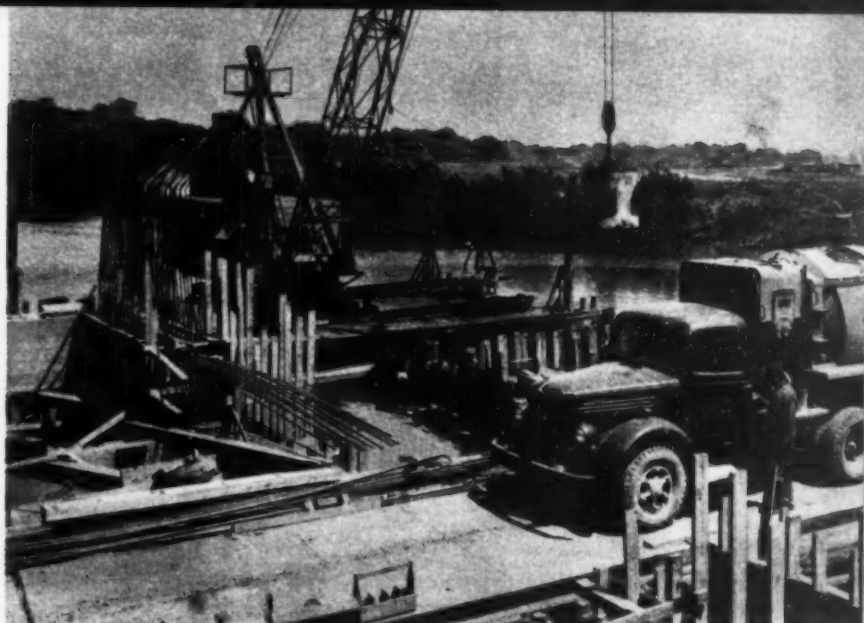
Construction of access roads on a large scale began soon after the passage of the Defense Highway Act of November 19, 1941, which authorized \$150,000,000 for construction of access roads to military and naval reservations, to defense industries and to sources of raw materials when such roads are certified as important to the national defense by the Secretary of War or the Secretary of the Navy. An amendment to this act on July 2, 1942, provided an additional \$110,000,000.

The funds were made available to pay the full cost of improvements, including right-of-way, but it has been the policy to seek local participation to the extent of important local benefits.

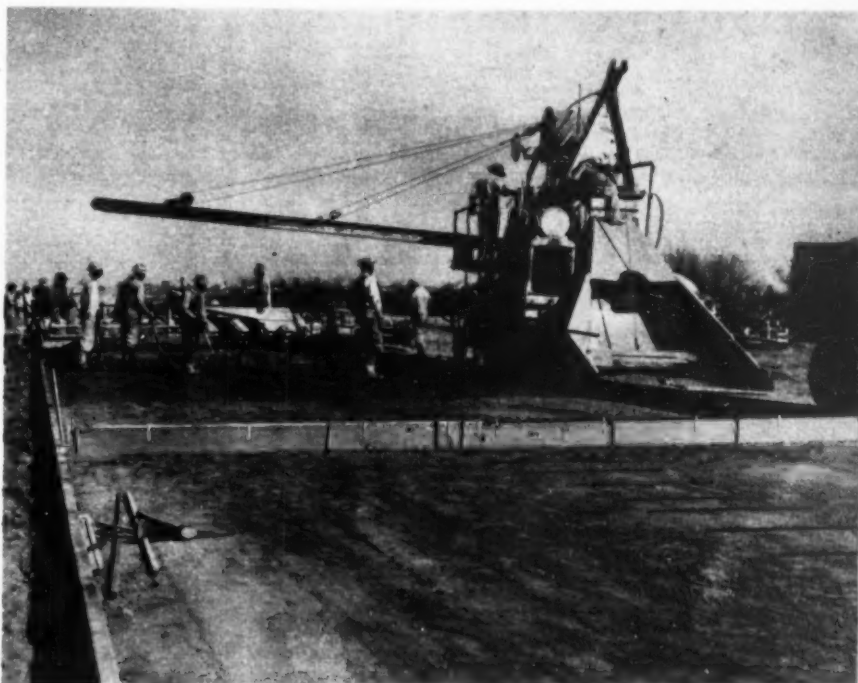
The burden of actually launching the large construction program fell largely upon the state highway departments at a time when the supply of contractors, men, material and equipment had reached the end of a period of plenty and was entering a period of increasing scarcity. Coupled with this was the war need of providing immediately improvements of substantial character to accommodate a great volume of traffic to and from war establishments. Roads were a first need in the building of war industry plants. Workers at plants in operation were sometimes delayed one and two hours in

(Continued on page 76)

WIDE OILED-GRAVEL ROAD (below) is built on approach to one of army training centers in Colorado.



WITHIN COFFERDAM concrete is poured for substructure of Boundary Channel bridge being built on one of routes from Washington, D. C., to new War Department building in Arlington, Va.



CONCRETE PAVING OPERATIONS are here shown in full swing on road leading to large aircraft assembly plant in Texas. Only steel reinforcement used in slab is that shown in right foreground.

SOLID FILLS (below) capable of supporting, soon after completion, access road pavements without excessive cracking are made possible by new methods of controlling materials and water content and by thorough consolidation with modern equipment, in this case a pair of sheepfoot rollers in tandem hauled by crawler tractor.



Balanced Earthmoving Outfit

**Pushes 1,200,000-Yd.
Airport Job To Meet
70-Day Time Limit**

COMBINING LONG-HAUL AND SHORT-HAUL EQUIPMENT in well-balanced proportions, an earthmoving outfit of James D. Morrissey, contractor, Philadelphia, recently completed a 1,175,000-yd. grading job for the U. S. Engineers on a CAA airport under specifications allowing only 70 days for completion of the work. To grade an area roughly 1 mi. square for an airport capable of taking large transport and bomber planes, the contract involved the excavation and placement in compacted fills of more than 1,100,000 cu.yd. of earth and more than 50,000 yd. of rock. A large fleet of trucks loaded by power shovels and elevating graders took care of long-haul operation ranging up to 3,000 ft.

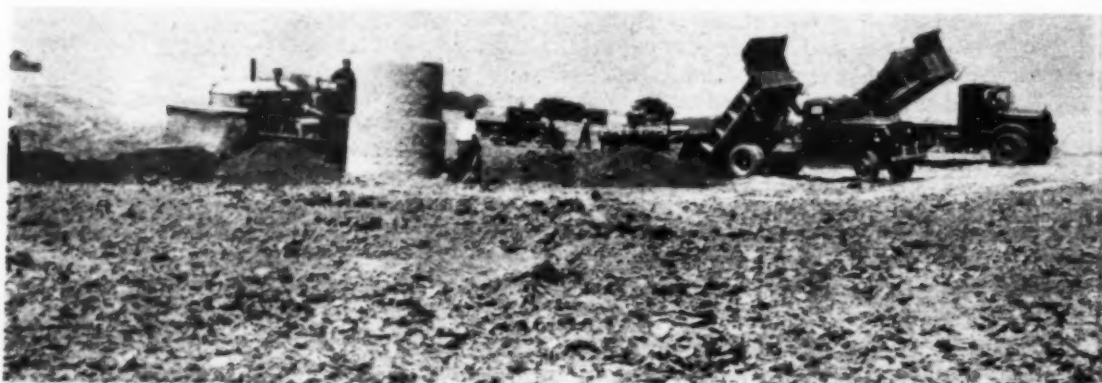
(Continued on page 48)



RESIDENT ENGINEER (left) in charge of airport construction for U. S. Engineers, on project described in accompanying notes, is **S. A. DOWNEY**. Grading contract involving 1,175,000 yd. of earthmoving is executed by **JAMES D. MORRISSEY** (right), Philadelphia.



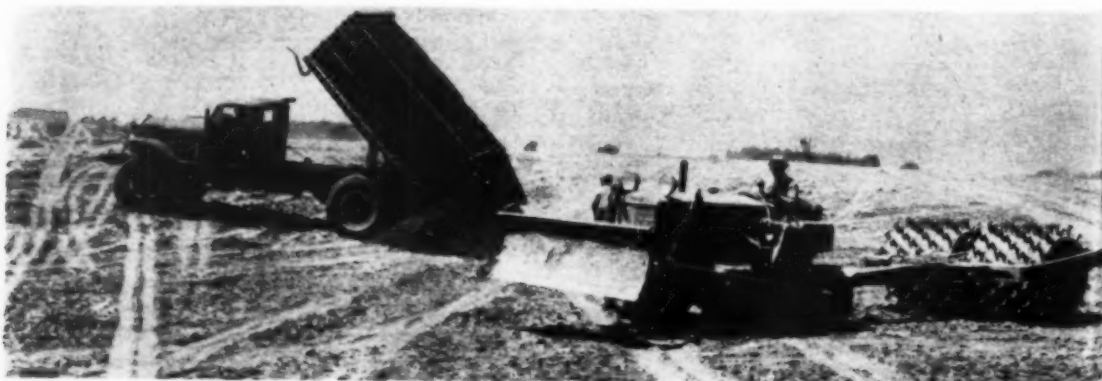
FOUR SHOVELS leveling hilltop for airport load excavated material into fleet of about 30 trucks hauling more than 1/2 mi. to dump. Total truck fleet includes more than 50 units.



LONG-HAUL MATERIAL delivered to fill by trucks is dumped for spreading by bulldozers prior to compaction by sheepfoot rollers. Manholes on line of trunk sewer have not yet been completed to full height.



STOCKPILING TOPSOIL for later use on landing strips and certain intermediate areas, tractor-drawn scrapers make roughly circular trip to strip soil and dump it on pile in background. Tractor scrapers handle short-haul excavation on job.



10-YD. LOAD is dumped on fill by Sterling diesel truck to be struck off in layers for compacting by sheepfoot tamping rollers.



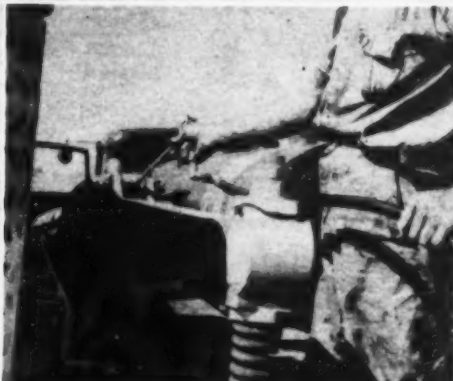
GREASE HOSE unreeled from spool on service truck supplies pressure lubrication to tractor fittings. Engine-driven air compressor on truck furnishes power to lubricant pumps which deliver greases at proper pressures from separate containers for chassis, track and gears.



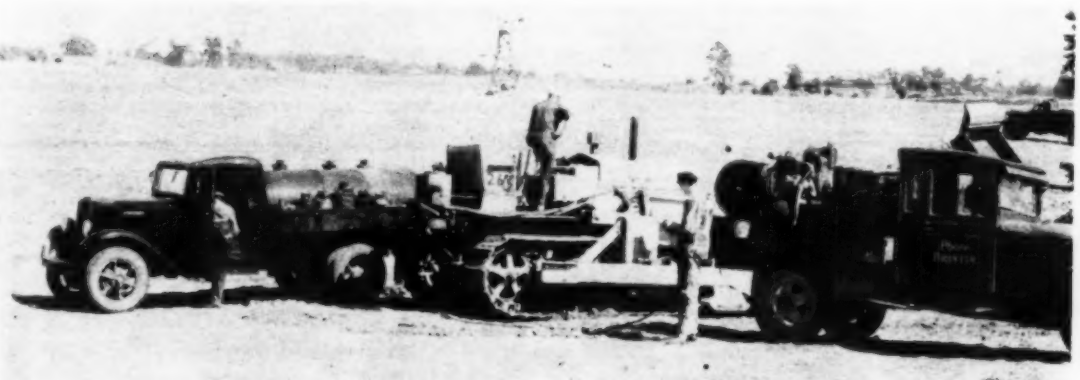
SERVICE OUTLETS of lubricant hoses are equipped with proper adapters or nozzles for delivering greases to track and chassis fittings or to gears.



HIGH-SPEED TRAVEL on long hauls is feature of this scraper unit powered by pneumatic-tired diesel tractor; assistance of tractor-bulldozer acting as pusher is required in loading scraper. Rooter at right is used to break up disintegrated rock for loading by tractor-scraper.



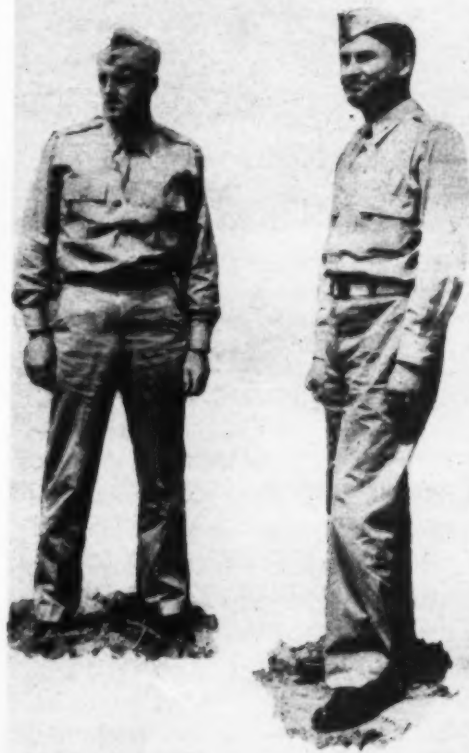
SQUEEZE-TYPE HAND VALVE controls delivery of chassis lubricant at 7,500-lb. pressure to toggle connection on bulldozer attachment.



ONE-STOP SERVICE on airport fill takes care of all fuel and lubrication needs of tractor-bulldozer standing between fuel truck at left and convoy luber outfit at right.



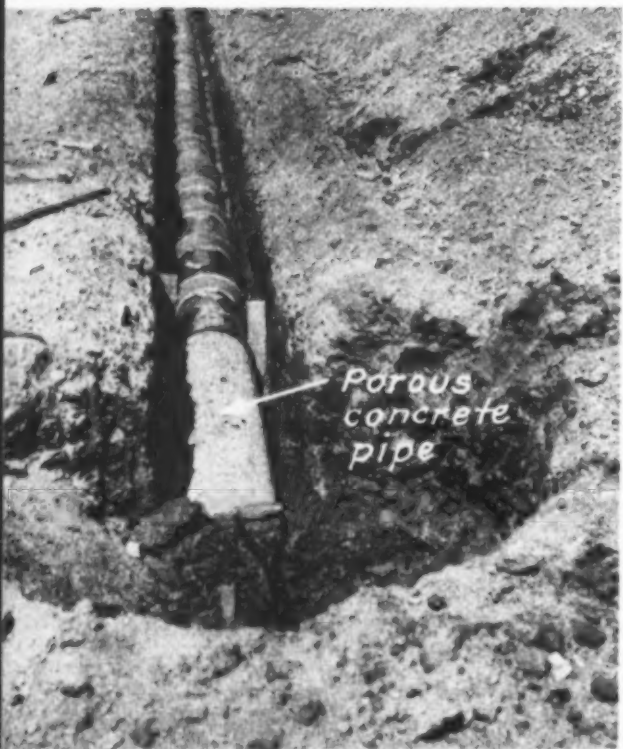
LANDING STRIP SUBGRADE compacted by sheepfoot roller is struck off to finished grade by diesel motor patrol.



AIRPORT PROJECTS in Philadelphia district of Corps of Engineers, U. S. Army, are supervised by Maj. McCOWN E. HUNT (right), chief of airport construction, assisted by Lieut. J. F. McGARRY (left).



OUTFALL SECTION of storm sewer is constructed of 48-in. reinforced-concrete pipe.



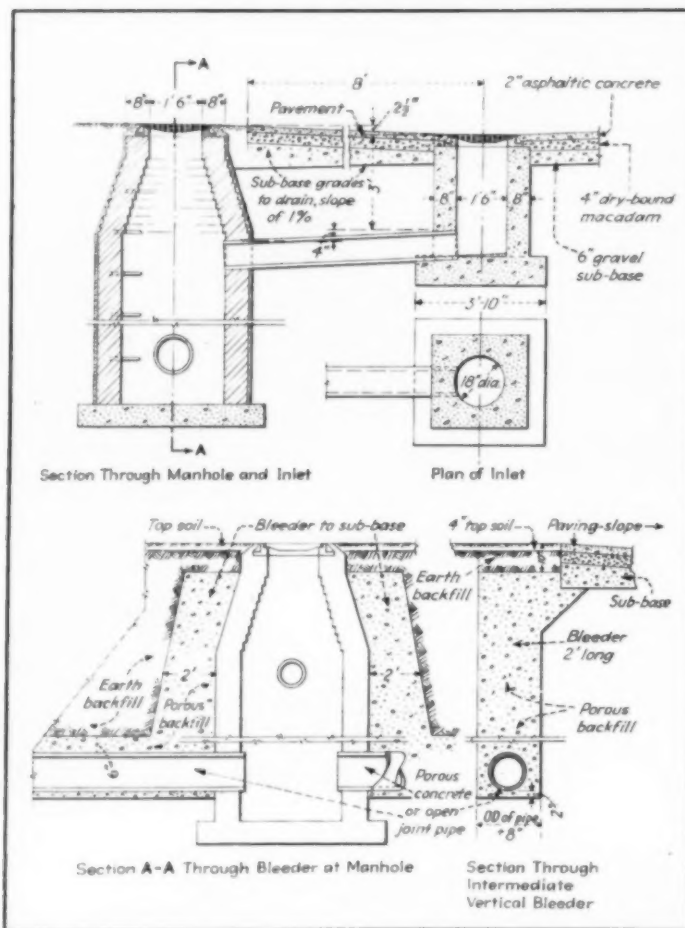
Porous concrete pipe

ADJACENT TO MANHOLE. paving contractor installs porous concrete pipe in edge drain along side runway to be paved.

HAMMER DRILLS (below) using detachable bits on drill rods sink 65 8-ft. holes in 10 hr



EXCAVATION WORK on airport project is directed for grading contractor by **FRANK PINGITORE**, superintendent in charge



PERVIOUS BLEEDERS over porous concrete pipe at manholes and intermediate locations trap subdrainage from pavement sub-base into buried drain at edge of runway. Surface runoff is collected by shallow gutter 8 ft in from edge of pavement, as shown in upper half of drawing, and is passed through inlets into edge drain.



IN CHARGE of maintenance crew and night shift respectively, are **WILLIAM C. ENGLISH** (left) and **IRVIN NIESSEN**.

or more and averaging 1,800 to 2,000 ft. while a battery of tractor-drawn wheel scrapers handled the short-haul work within the 1,000-ft. range, averaging 600 to 700 ft.

Supplementing this earthmoving equipment, a large number of tractor-bulldozers and motor graders spread truck-dumped material in 6- to 8-in. loose layers in the fills for compaction by tractor-drawn sheepsfoot rollers; the latter units also compacted the fill layers spread to required depth by the carrying scrapers. Despite the handicap of a shortage of operators for shovels and trucks, the organization maintained an output of 15,000 to 20,000 yd. a day during the first part of the job and later greatly accelerated

(Continued on page 108)

DIESEL-POWERED COMPRESSOR (below) on truck furnishes air to two drills working in mica schist on airport site.



Present and Accounted For—A PAGE OF PERSONALITIES



NEW PRESIDENT of American Society of Civil Engineers, installed at annual meeting this month, is **EZRA B. WHITMAN**, of Whitman, Requardt & Smith, consulting engineers, Baltimore, Md., and chairman of Maryland State Roads Commission. Mr. Whitman has served as division engineer with Baltimore Sewerage Commission and as chief engineer of Water Board of Baltimore. In present war his firm has been engineer-architect on three chemical warfare projects costing \$135,000,000.



NEW STATE HIGHWAY ENGINEER OF INDIANA is **RAY H. BOWER** who succeeds late Merton Keele. Graduate of Purdue (1912), he started work with Santa Fe Railroad and later joined Davis Construction Co. He has been connected with Indiana Highway Commission since 1933 as district engineer and assistant chief engineer. In first World War Mr. Bower was captain, Engineers.

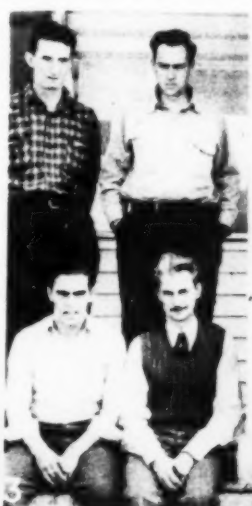


AMERICAN ROAD BUILDERS ASSOCIATION will be headed this year by **C. W. BROWN**, chief engineer of Missouri State Highway Department. He succeeds Major Chris J. Sherlock, now in active service with U. S. Corps of Engineers. Graduate of University of Missouri (1910), Mr. Brown served with C. B. & Q. Railroad and later entered private practice. He joined Missouri highway department in 1918, progressing through grades of office engineer, and assistant chief engineer.



INSPECTING LARGE ARMY CANTONMENT under construction in New York State are (left to right): **WALTER WEISKOPF**, Operations Branch, N. Y. District Engineers Office; **BRIG-GEN L. R. GROVES**, Construction Division, U. S. Corps of Engineers, Washington, D. C.; **D. G. ARONBERG**, project manager for Cauldwell-Wingate Co. and Poirier & McLane Corp., joint contractors; **WILLIAM M. VARKER**, project manager for Tuttle, Seelye, Place and Raymond, architect-engineers; **MAJOR DREW C. EBERSON**, Area Engineer, N. Y. District Engineers Office; **MAJOR CHARLES K. PANISH**, N. Y. District Engineers Office; and **A. L. LOCKWOOD**, real estate department, North Atlantic Division Engineers Office.

Airport Builders



(1) **THUMBS UP** for progress on tough war job of Corps of Engineers is signaled by **DAVID NASSIF** contractor, Boston, as he successfully pleads with head of selective service to defer valued operator until airport grading is completed. (2) **CONVERTED FARMHOUSE OFFICE** provides headquarters for **LT. COL. C. D. REIDPATH**, area engineer, who directs construction of large airport project for Corps of Engineers, U. S. Army. (3) **HIGH-SPEED GRADING CONTRACT** on difficult airport site is completed by David Nassif Co., with these men in charge: (Top row, left to right) **CHRISTOPHER DELANEY**, superintendent; **K. E. CURRAN**, super-

intendent; **E. J. O'BRIEN**, project manager; **M. S. KITTRIDGE**, master mechanic; **S. B. KIMBALL**, purchasing agent; **F. W. O'BRIEN**, office manager. (Lower row, left to right) **J. H. SCHLOBOHM**, equipment foreman; **HENRY FEAR**, head timekeeper; **A. N. GUERRIERE**, general foreman; **RAYMOND WOOD**, equipment superintendent; **JOSEPH RICH**, general foreman; **R. G. KEYES**, master mechanic. (4) **EQUIPMENT REPAIRS** on airport grading contract of George M. Brewster & Son Co., Bogota, N. J., are made under careful supervision of **CLARENCE LAVENDER**, master mechanic.



Highway Engineers and Contractors Build

West-Coast Flight Strip

COMPLETED FLIGHT STRIP built under direction of Public Roads Administration for use of Army Air Forces provides graded area of about 100 acres marked by asphalt-paved runway 150 ft. wide and 4,000 ft. long. Stabilized runway extensions and shoulders border paved area.

By T. H. DENNIS

Maintenance Engineer
California Division of Highways,
Sacramento, Calif.



GRADING SITE for flight strip, Caterpillar elevating grader with 48-in. belt loads spoil into trucks.



ON EMBANKMENT CONSTRUCTION for flight strip, Le Tourneau scrapers spread earth in loose layers of 6-in. maximum depth for watering by tank trucks and compaction by sheepfoot tamping rollers.



IMPORTED BORROW MATERIAL consisting of sand and gravel with sufficient binder for compaction is spread from truck-dumped piles by tractor-drawn scraper and is windrowed by patrol grader to blend and dry soil mixture. When ready for compaction in runway sub-base or stabilized areas, material is placed in 4-in. maximum loose layers for consolidation by tamping rollers.

RECENT CONSTRUCTION of a flight strip is just one of many special jobs indicating the extent to which the California Division of Highways has converted its organization and equipment to the war effort. Engineering personnel have worked long and late hours on the preparation of plans and the supervision of access-road and flight-strip construction, while the maintenance organization, in addition to the heavy repair demands occasioned by contract hauling for government facilities, is maintaining an ever increasing number of satellite air fields. The extent to which this service can be continued will depend entirely upon the retention of trained personnel and the ability to obtain necessary and timely deliveries of equipment parts, tires and construction materials.

The special knowledge and technique of the highway engineers in the field of loading design and soil values have been especially valuable to the government in the construction of flight strips. Here

proved experience is essential for the protection of valuable life and property. Here, too, the contracting fraternity has demonstrated its ability to duplicate the assembly line methods of the most advanced production plants. A brief description of the design, materials and methods employed on one of these flight strips, whose location will be nameless, follows:

The flight strip was graded 500 ft. wide for a length of 8,000 ft., the central 350 ft. of which was stabilized for a 6,000-ft. length by the addition of from 1 to 2½ ft. of imported borrow. On the central portion of this stabilized area, starting 1,000 ft. back from the ends, an area 150 ft. wide by 4,000 ft. long was covered with 9 in. of gravel, followed by a 3-in. course of plant-mix bituminous material. The 150-ft. surfaced width was constructed as a tilted section on a 1.5 percent slope, which gave a 2¼-ft. drop overall, as indicated in the accompanying cross-section.

Construction Details

Clearing and Grubbing—The entire area was cleared. All stumps and large roots were removed, regardless of height of fill.

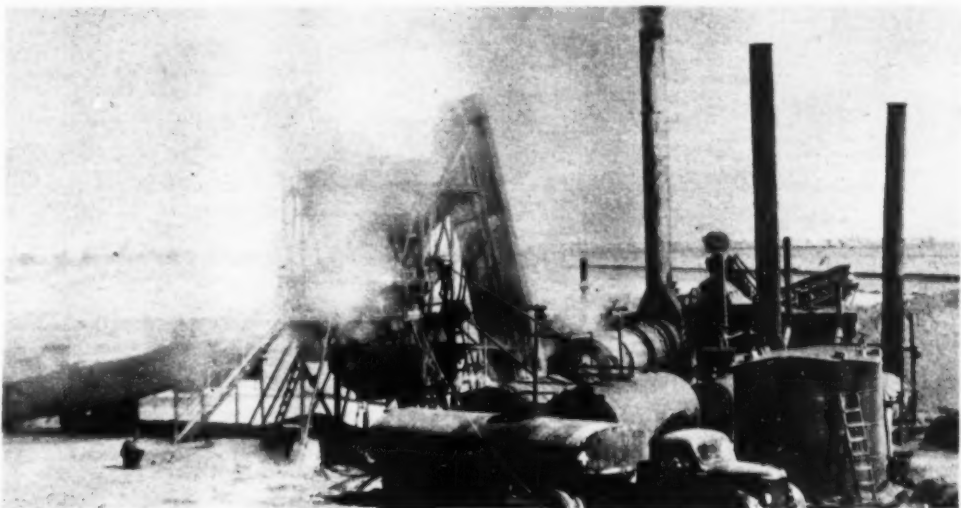
Earthwork—Embankment was constructed in 6-in. maximum layers, loose, before compaction. Relative compaction of 85 percent was required.

Imported Borrow—For runway sub-base and stabilized areas, the imported borrow consisted of sandy or gravelly material which compacted readily under

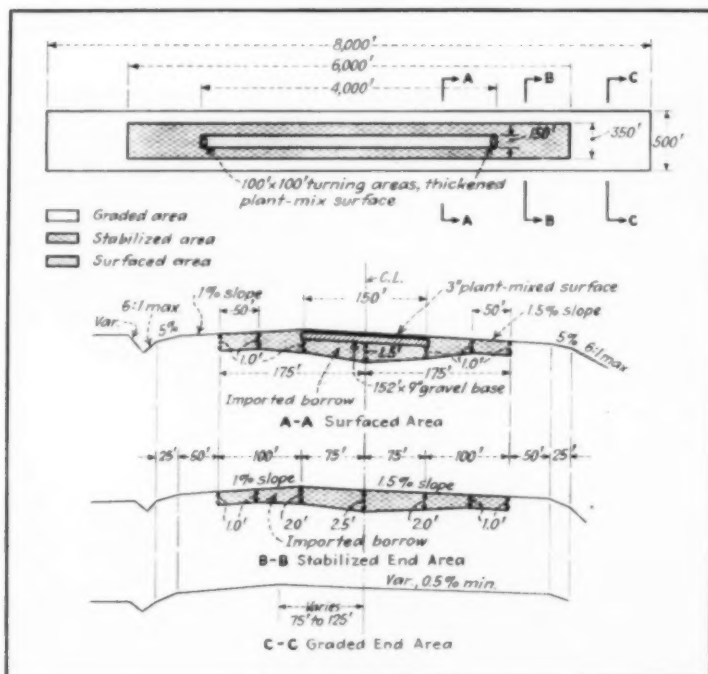
(Continued on page 130)



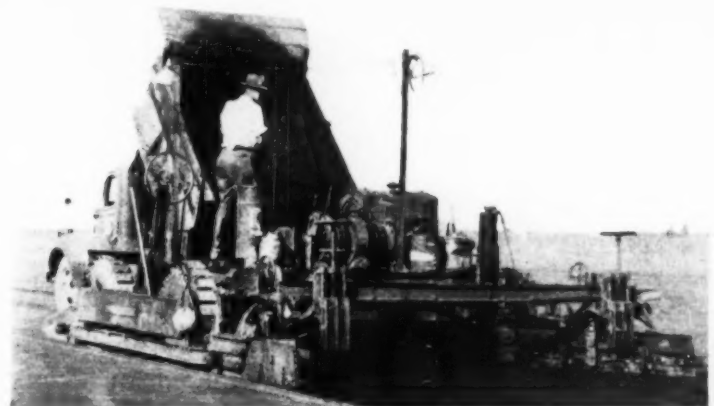
THREE 1¼-YD DRAGLINES, two Marions and a Northwest, load borrow material out of pit for delivery by trucks to flight strip area. Selected pit-run material is being excavated here for compacted gravel base under runway pavement.



ASPHALT PLANT turns out hot-mix material for paving 4,000x150-ft. runway.



FLIGHT STRIP 8,000 ft. long by 500 ft. wide has asphalt paved runway, 4,000x150 ft., centered in stabilized area measuring 6,000 ft. by 350 ft. Two-course plant-mix runway pavement is placed on 9-in. stabilized gravel base supported by sub-base at least 1 ft. thick of compacted sand-gravel imported from borrow pit.



ASPHALT SURFACE of paved runway is placed in two equal courses to total depth of 3 in. by Jaeger self-propelled spreading-finishing machine.



AFTER PRELIMINARY COMPACTION by pneumatic-tired rollers, asphalt pavement is compressed and ironed to even plane with three-axle 14-ton Buffalo-Springfield roller.



SHOOTING OF TUNNEL SCENES (left) takes place in 27-ft.-diameter reproduction of subaqueous tube lined with rings made of wallboard and 2x4-in. lumber. Shield at rear is reproduction in wood of unit actually used on Queens-Midtown Tunnel under East River, New York City. In right background Claudette Colbert is being rescued from muck by Fred MacMurray during rehearsal of blowout scene.

Movie Shield "Tunnel"

**Is Replica in Wood and Wallboard,
of 27-Ft. Subaqueous Tube Built
on Paramount's Hollywood Lot**

WITH THE TECHNICAL ADVICE of Charles A. Wall, civil engineer on the staff of the New York City Tunnel Authority and veteran of the Brooklyn-Battery, Lincoln, Queens-Midtown, Holland and other subaqueous vehicular tubes, Paramount Pictures, Inc., erected on its production lot in Hollywood, Calif., a 27-ft.-diameter shield-driven, compressed air "tunnel" about 50 ft. long to serve as the setting for a number of scenes in the motion picture "No Time for Love", starring Claudette Colbert and Fred MacMurray. In the film Miss Colbert, in her role of ace photographer for a magazine, is given the tough assignment of obtaining a series of pictures of sand-hogs at work in compressed air on the "Interborough Vehicular River Tunnel Project". Mitchell Leisen, who directed the picture, insisted on having the tunnel scenes accurate in technical detail and great pains were taken to provide a setting that reflected present-day practice in compressed-air tunneling. The results are shown in the accompanying photographs of tunnel scenes from the motion picture.

Wood and Wallboard Substitute

Plywood, wallboard or "studio board", and lumber were the chief materials used ingeniously as substitutes for the heavy bolted cast-iron rings ordinarily used for lining a real subaqueous tube of the type pictured. The ring segments were 2½ ft. wide, made up of curved wallboard panels and 2x4's, covered on the outside with fabric to

(Continued on page 126)

TUNNEL DETAILS (below) are accurately reproduced in stage setting on Paramount's Hollywood lot. At left, rings of wallboard segments with wood bolts and nuts and compressed air pipe form realistic background for Claudette Colbert. At right, airlock scene shows Fred MacMurray (extreme left) and Claudette Colbert with camera on way into compressed air tunnel to carry out magazine assignment of photographing sand-hogs at work.





MINIATURE TUNNEL built to one-sixth scale of regular bore was used for certain photographic shots. Tube, open on one side, was about $4\frac{3}{4}$ ft. in diameter and 80 ft. long. Piping is about $1\frac{1}{2}$ in. in diameter and hand shovel in right foreground about 7 in. long.



STRUGGLING IN LIQUID MUCK sand-hog crew endeavors to escape from face of tunnel after blowout occurs.



TECHNICAL ADVISER on tunnel technique in film comedy "No Time for Love" was **CHARLES A. WALL** (left) engineer with N. Y. City Tunnel Authority, here pictured in autographed print with stars, **FRED MACMURRAY** and **CLAUDETTE COLBERT** and Director **MITCHELL LEISEN**.

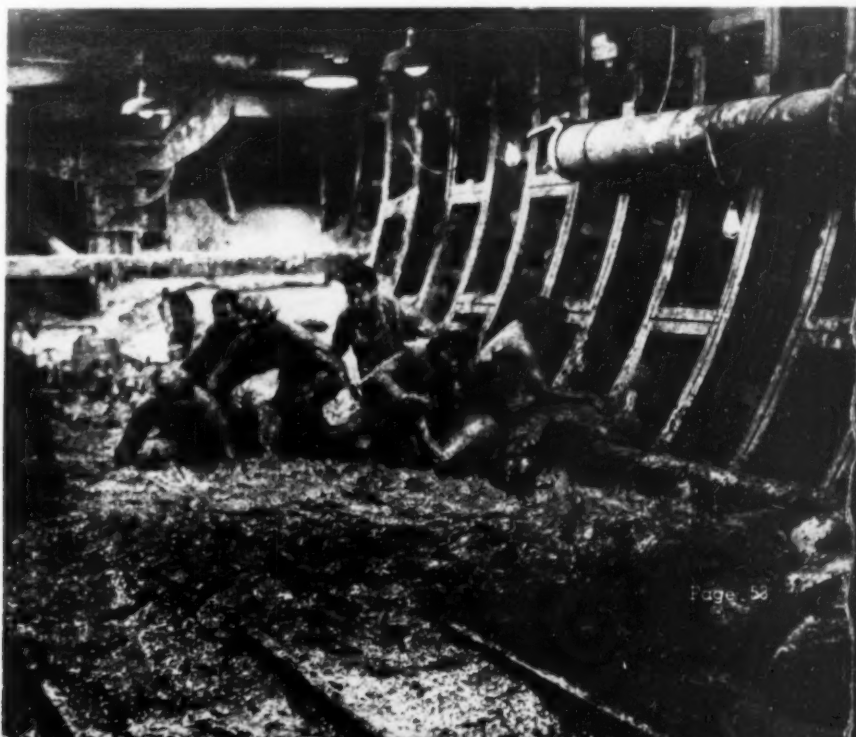


SMEARED WITH TUNNEL MUCK in blowout scene Miss Colbert comes up smiling as she observes Fred MacMurray waist deep in wet adobe ooze discharged into tube from tail tank behind shield.

ATOP ELECTRIC LOCOMOTIVE (below) Miss Colbert is instructed in compressed-air tunneling lore by Rod Cameron, himself an engineer in real life, who plays role of contractor's engineer in picture. To reduce weight of locomotive, batteries were removed and dummy battery-box of plywood was substituted. Electric power for locomotive was supplied from stage switchboard by long cable not visible in picture.



REALISTIC BLOWOUT SCENE (below) is produced by discharging tankful of wet adobe mud from tail tank in back of tunnel shield.

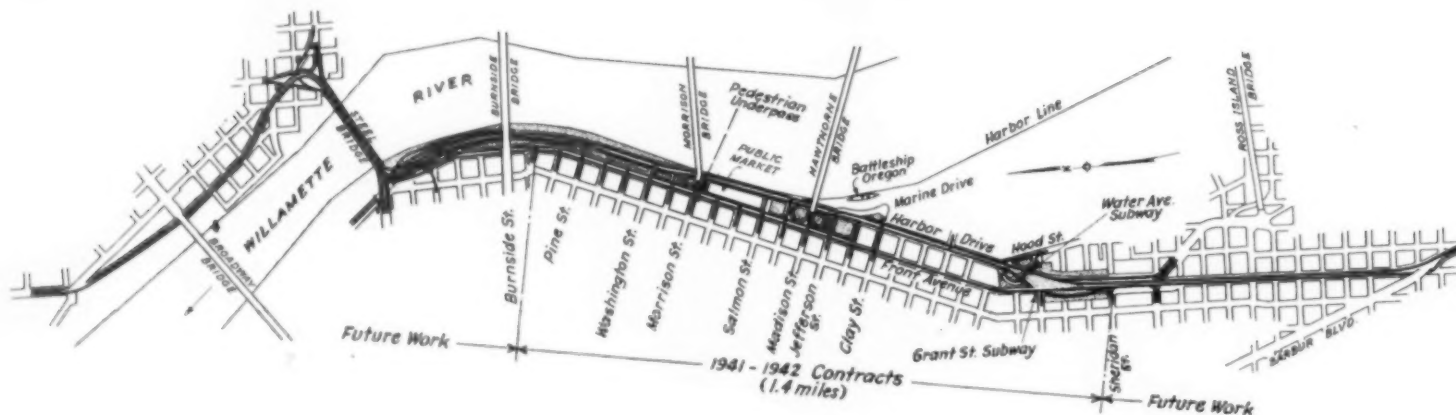




RAZING OF BUILDINGS to widen Front Ave. is done by pulling down brick walls with cables from 2-drum winch mounted on tractor.

Waterfront

**To Provide Six-Lane
Paved Drive and
Avenue Widened by
Razing Buildings**



ALONG WATERFRONT of Portland, Ore., current contracts cover length of 1.4 mi. and include new 6-lane concrete-paved Harbor Drive and widening of Front Ave. to 80 ft. by razing buildings for 18 blocks.

SIX-LANE HARBOR DRIVE (below) along Willamette River is paved with 7-in. thick plain concrete slabs, with central dividing strip 4 ft. wide between opposing lines of traffic.



Modernized

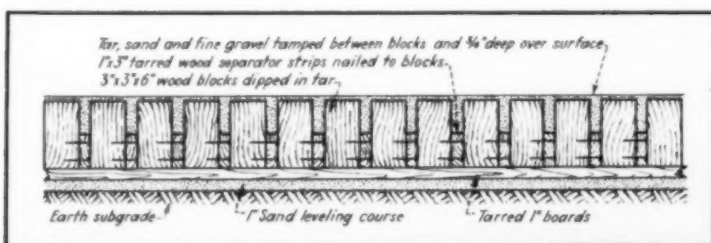
By F. T. YOUNG
Acting Division Engineer,
Oregon State Highway Commission,
Portland, Ore.

DURING THE LAST EIGHTEEN MONTHS, the downtown waterfront of Portland, Ore., has undergone a sizeable face-lifting operation. A 25-year dream of progressive Portlanders is about to be realized through the completion of the first section of modernized Front Ave., extending along the west bank of the Willamette River from S. W. Couch St. to S. W. Sheridan St., a distance of 1.4 mi. This is but a portion of the planned project, as the improvement will ultimately extend south to a connection with Barbur Boulevard, an outlet to the Tualatin Valley, and north across the Willamette River to Interstate Ave., and a connection to the Pacific Highway East, and on into the State of Washington.

To go back into Portland history, we find the original town was platted in 1884 along the west bank of the Willamette River. The oldest building along Front Ave. was built in 1853. Another old building, the Vaughn Block, bore a metal date plate of April 27, 1865. It was probable that these buildings were gutted in the fire of 1873, but the original walls were intact until the march of progress called for their wrecking to make way for the present improvement.

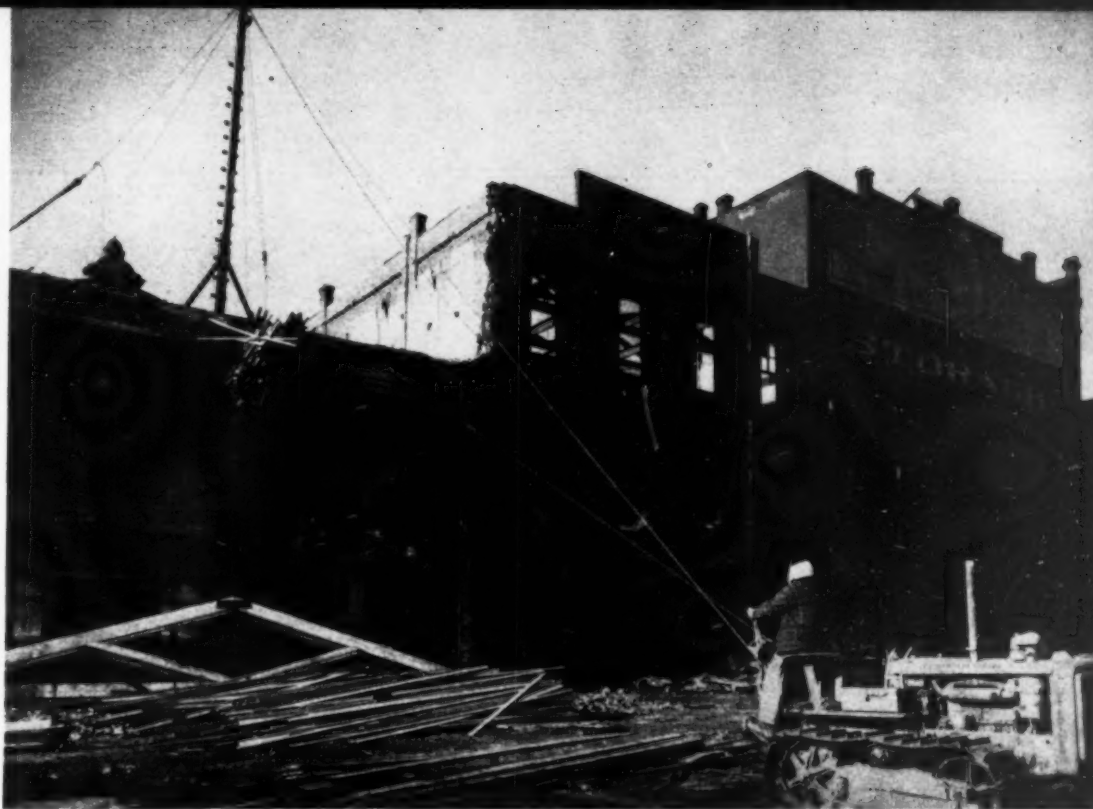
In 1865, Front Ave. was paved with Nicholson pavement, which was laid to the following specifications: 1 in. of sand on earth subgrade; 1-in. boards, tarred on both sides; 3x3x6-in. wood blocks, set on edge, the lower 3 in. being dipped in tar; 1x3-in. by 3-ft. tarred wood separators; gravel and tar tamped into spaces; 3/4 in. of tar, gravel and sand spread on the surface. With this type of surface it was necessary, during the June floods each year, to weight it down with rocks. The Nicholson pavement was replaced some years later by Belgian blocks, quarried by hand from a point on the lower Columbia River.

In 1929, a seawall was constructed along the west bank
(Continued on page 122)



RELIC OF PAST is this Nicholson pavement laid on Front Ave. in 1865. Wood blocks, stood on end on tarred boards supported by 1-in. sand base, are separated by wood strips, with joints filled with tar, fine gravel and sand.

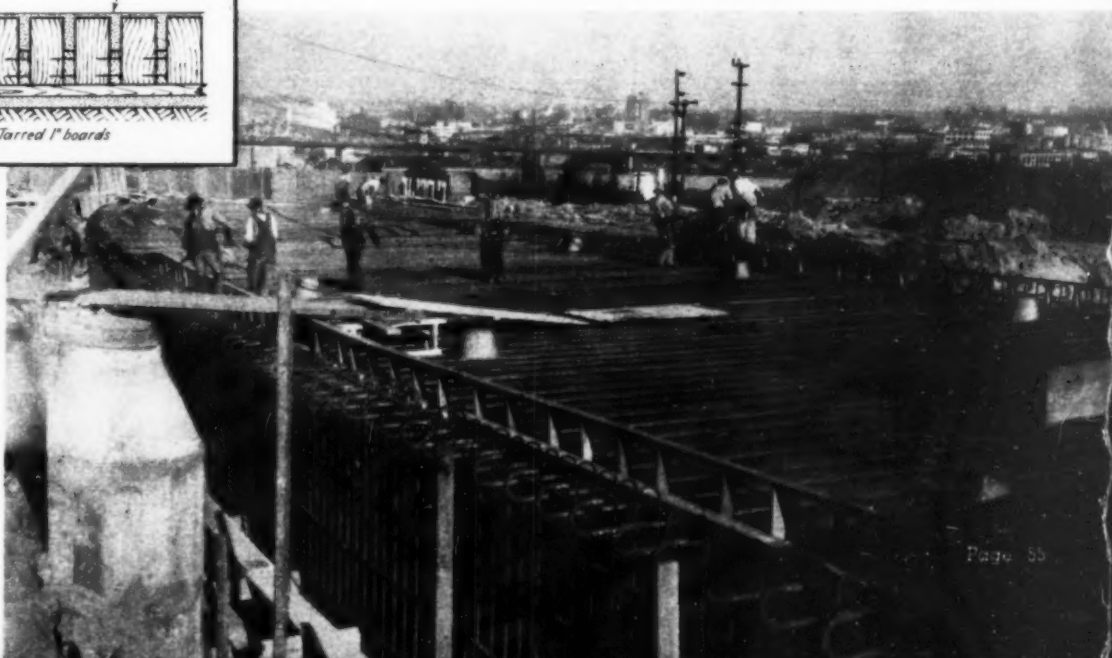
DIVISION OF TRAFFIC (right) at Grand St. is accomplished by underpass which carries south-bound Harbor Drive beneath Front Ave.



SALVAGE OF LUMBER and other materials from wrecked buildings on Front Ave., is handled by gin pole from which cable runs to two-drum winch on diesel tractor.



PEDESTRIAN SUBWAYS are safety features of waterfront improvement project in Portland, Ore.

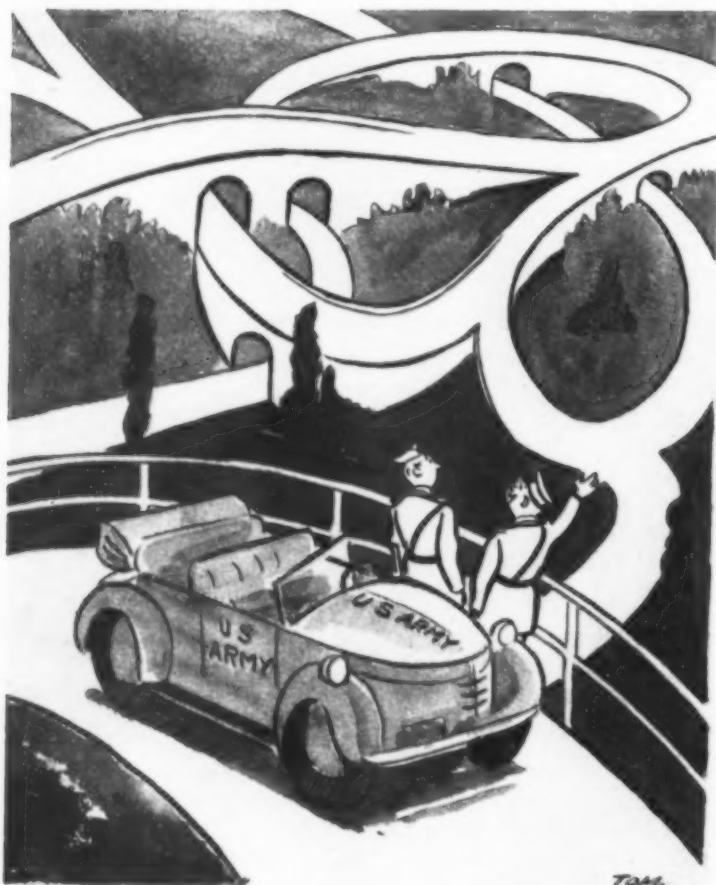


THE JOB JESTER

CARTOONS DRAWN FOR CONSTRUCTION METHODS



"You should have been here before they started the Defense program."



"Our engineers designed it to save gas and tires — the confused motorist winds up staying at home."



BLAKLEY-

"Mr. Bossman, did you-all advertise for a black-top man?"

Blitz Construction

COMPLETES ARMY AIRFIELD IN

70 Calendar Days



SCRAPER LOAD of natural sand soil is spread in even layer to raise grade for shoulder on which stabilized clay-gravel mixture will be placed.



PNEUMATIC-TIRED ROLLER compacts clay-gravel while multiple-blade drag smooths surface of stabilized shoulder.



CLAY-GRAVEL MIXTURE for stabilized shoulders is produced by portable duplex crushing plant which turns out average of 200 cu.yd. per hr. Truck-mounted diesel power unit drives crushing plant. Draglines feed virgin material to hopper of portable plant. Clay dumped from truck at far left is fed on to plant belt by auxiliary conveyor. Mixed material drops from discharge conveyor at right into truck.

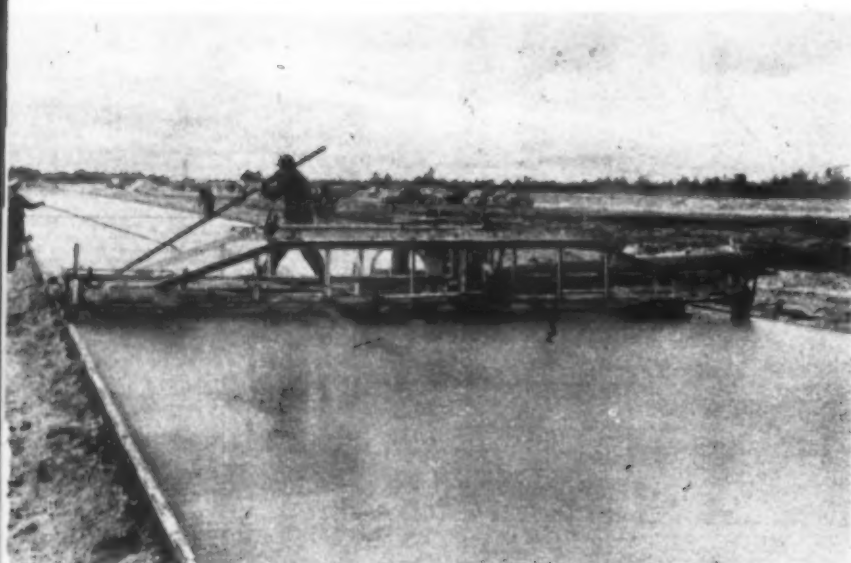
WITH EVERY RESOURCE trained on the main objective of completing a physically fit and acceptable airport in minimum time, the Corps of Engineers, U. S. Army, and a bold contractor aided by a group of one-time competitors took over a small county field in the Middle West and in 70 calendar days completely revamped and expanded the site into a freshly graded and paved airfield, ready for use by bombers, fighters or trainers. In that brief period, the constructors transported equipment to the field, cleared and grubbed more than 180 acres of woods, completed 260,000 yd. of grading, put down more than 375,000 sq.yd. of clay-gravel stabilized base and laid over this base an equal yardage of 10-7-10-in. concrete pavement, non-reinforced but equipped with steel dowels at expansion joints. Only by concentrating on the basic purpose of building the airport in the shortest possible time, eliminating all non-essentials



LONG BOOM on 34E dual-drum paver places concrete across 25-ft. lane while mixer travels outside forms on stabilized base for adjacent lane. Fiber filler and steel dowel assembly are in place for expansion joint.



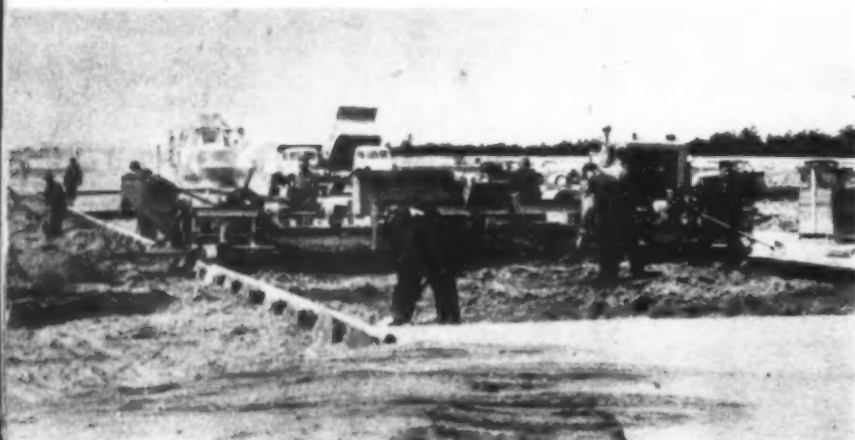
HOSE STREAM wets sand subgrade ahead of concrete placement in 25-ft. lane. Tank truck furnishes water for both mixer and hose stream. Wood strip attached to steel form on far side of lane makes groove in edge of slab for keyed joint. Concrete is struck off by two-screed finishing machine.



JOINT MACHINE installs longitudinal center-line contraction joint and transverse contraction joints. Workman on machine is raising steel cap off expansion joint.



SUBGRADE PLANER attached to 27E paver carries heavy bank of sand which is shoveled by hand where necessary to fill ruts or waste excess material outside 25-ft. lane.



SELF-PROPELLED SUBGRADE MACHINE (left) riding on steel forms pulls itself forward by winding steel cables on winches. Scraper conveyor on machine spills excess material outside paving lane.

which would impede the progress of the work, were the supervising engineers and contractors able to meet the almost impossible schedule which they had set for themselves.

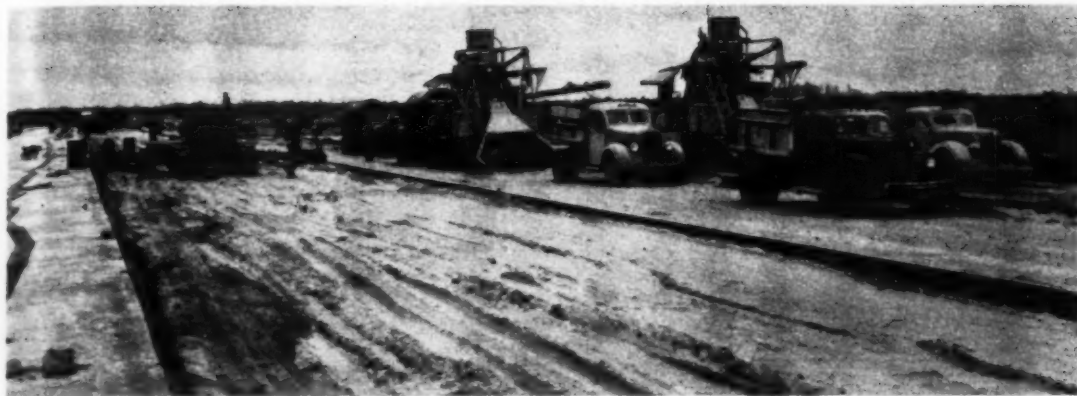
When the contractor signed the contract for grading, drainage and paving of the airport on Aug. 7, he named Oct. 18 as the date by which he would complete the 376,444 sq. yd. of concrete pavement on runways, taxiways and apron. Actually, the last pavement was placed Oct. 15. On the day following the signing of the contract, a field crew started clearing and grubbing. Grading operations, which included removal of

VETERAN OF FIRST WORLD WAR, this iron four-wheel-drive road maintainer, originally steam-powered but later converted to gasoline, proves potent tool for scarifying high spots in stabilized clay-gravel base.

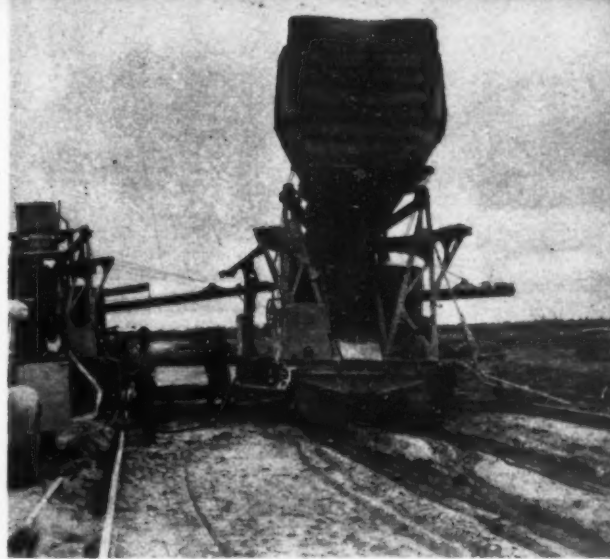


TWO 27E PAVERS (below) operate in combination to place concrete in 25-ft. lane. In paving this outside lane, one mixer has to travel on subgrade, while second machine operates on stabilized base for adjacent lane.





PAVING SECOND HALF of runway 150 ft. wide, two 27E pavers start with outside lane. At same time, sand fill is spread on top of stabilized base in inside lane in preparation for next pass of pavers. Note joint filler material laid on completed slab at left, ready to be placed in longitudinal expansion joint on center line of runway.



WHERE PAVES is forced to operate on sand fill inside forms, batch trucks and mixer cause rutting and disturbance of sand cushion, necessitating final strike-off by subgrade planer attached to paver.



PEAT POCKET is excavated by 2-yd. dragline which loads material into trucks on sand-fill haul road. In background, sand trucks backfill excavated hole by end-dumping. Peat trucks are spotted on duck boards which catch spillage.



SELF-UNLOADING TRUCKS operated by cement company haul bulk cement from mill to individual batching plants of four paving outfits.

the bituminous runways and taxiways of the existing field, got under way within a week. Spreading and compacting of the 5-in. stabilized base followed closely behind the grading for the new runways, taxiways and apron.

Paving Progress

Five paving mixers, owned by the prime contractor and three subcontractors, participated in the construction of the pavement. Grading and placement of stabilized base caused some delay in starting paving operations. The five pavers went into action on the following

dates: Aug. 25, one 34E dual-drum; Aug. 31, two 27E single-drums; Sept. 5, one 27E single-drum; and Sept. 18, the fifth and final mixer, a 27E single-drum. The 34E dual-drum was a Ransome machine, while the four 27E's included one Foote, one Rex and two Koehrs which sometimes worked as a pair on one paving lane. Work proceeded on a schedule of one shift a day, six days a week, with Sunday being utilized to make up any day lost by bad weather.

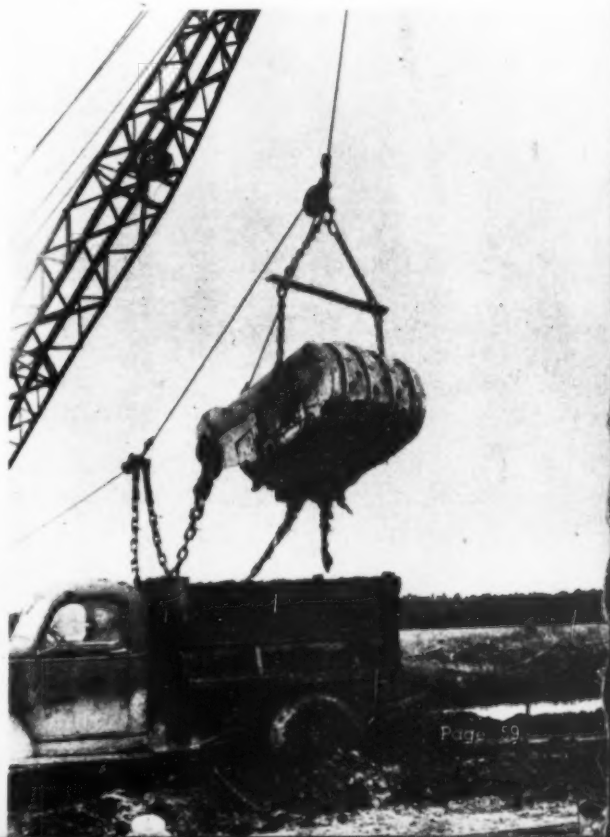
By Oct. 10, the work had narrowed down to two inside lanes on the runways, allowing the release of three pav-

(Continued on page 117)

IMPERVIOUS MEMBRANE (below) of transparent liquid compound containing red dye which fades out in few hours is sprayed on slab to seal surface against escape of moisture while concrete cures. Pressure pump on rolling bridge forces liquid through hose to spray pipe.



PERFORATED DRAGLINE BUCKETS (below) permit water to drain out of excavated peat and thus lighten loads for faster handling.





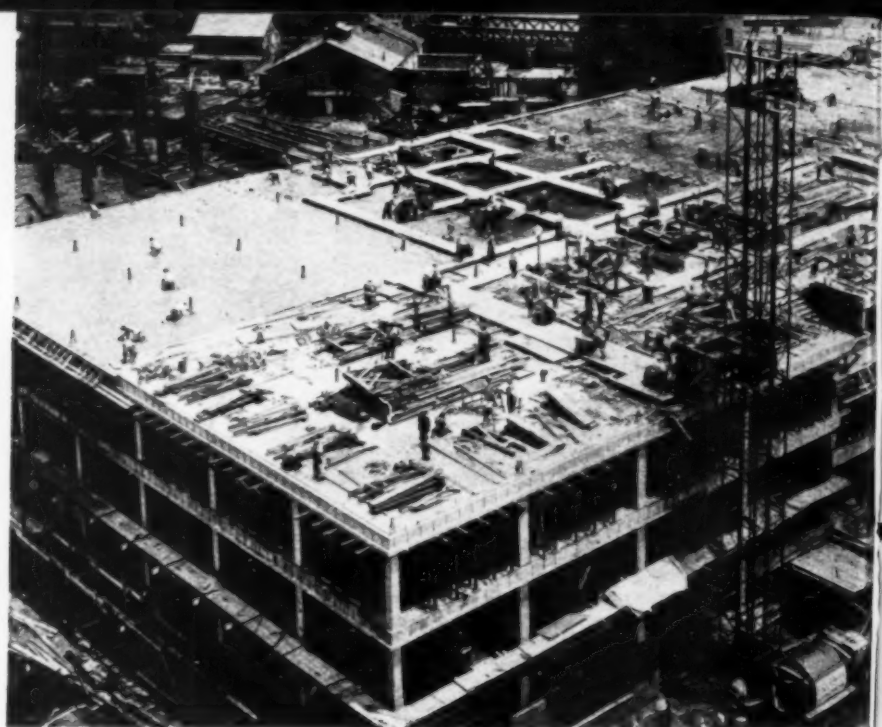
MOBILE SQUADS OF BUILDERS in Britain move from one site to another to erect structures for accommodation of troops and storage of supplies. Here pictured is crew setting tubular steel framework for Iris huts to serve as storage building and workshop.

British Combine Photo



IMPROVED DRYDOCK for minor repairs to propeller of small launch is furnished by movable ladder carrying cutter head of big suction dredge owned by J. P. Porter & Sons, Ltd., general contractors, of Toronto, Canada. After launch had been spotted to bring its stern over ladder, ladder was slowly raised to lift stern of launch above water and allow repairs to propeller to be made. "Drydocking" operation required only few minutes.

DEMOLITION OF CONCRETE on shore of Lake Michigan is done with Barco hammer powered by small air-cooled gasoline engine forming integral part of tool and served by portable electric storage battery for ignition system. Exhaust from engine, delivered through blower tube attached to drill steel cleans cuttings from hole.



STEEL TOWER 120-FT. HIGH, equipped with 125-hp. two-engine gasoline hoist and 31-cu.ft. bucket, enables forces of Turner Construction Co., of New York, to deliver ready-mixed concrete to floors of new production utility building, 375x155 ft. in plan, erected for Navy Department at yard on Eastern seaboard. Structure with reinforced concrete frame and brick walls has four main stories and fifth story for 190x46-ft. fan room. At floor levels, concrete is discharged into hopper feeding rubber-tired buggies which are pushed along runways to floor forms. Concrete was poured at rate of two floors per week and building was completed in five months, despite delays caused by unusual foundation difficulties.

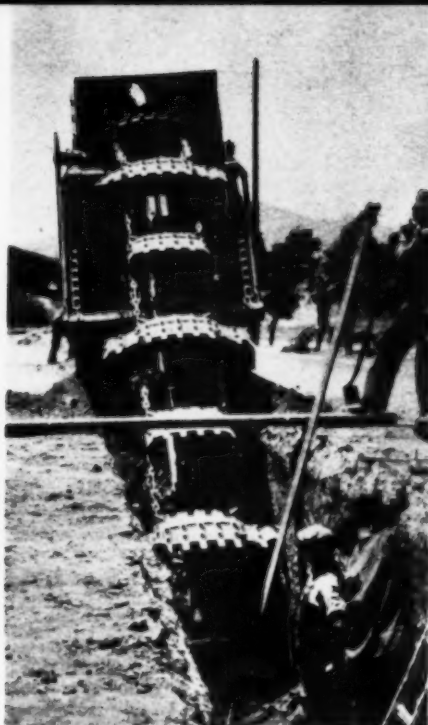
HOW *They Did It*

CONSTRUCTION DETAILS

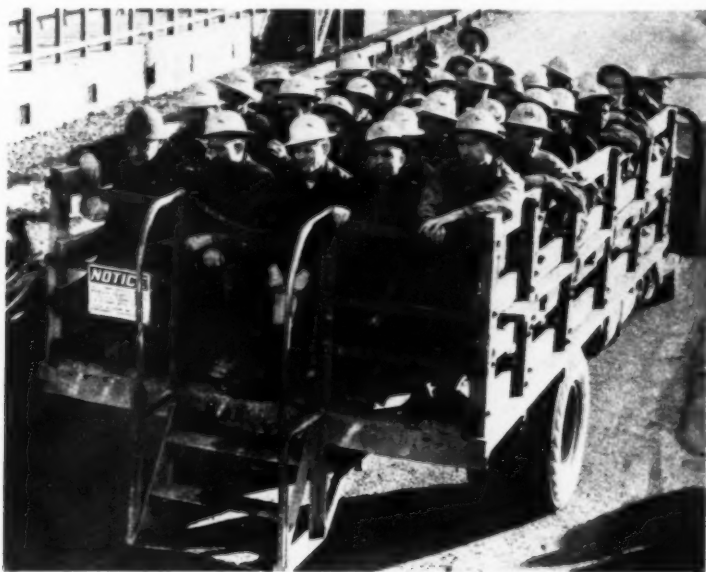
For Superintendents and Foremen

TO SAVE CRITICAL METAL wolmanized wood covers for sewer manholes are being used by Los Angeles County, Calif. Covers are of laminated wood strips of 2x8-in. stock dressed to 1½x7½ in., each held by four 20 penny nails. At least two ¾-in. bolts, countersunk at both ends, extend through cover, which is 7½ in. thick, 2 ft. in diameter and weighs 130 lb. Pair of 3x¾-in. slots provide for insertion of lifting hooks. Covers, seated on concrete frames, were designed by Alfred Jones, county surveyor and C. E. Arnold, chief deputy.





BY ADDING SIDE CUTTERS (right) to Buckeye trencher the Pacific Pipe Line Construction Co., of San Jose, Calif., was able to dig a 7½-ft. deep trench for gas pipe line to a width of 60 in., instead of 30-in. width for which machine with standard equipment is designed. Side cutters, each 15 in. wide, were attached to both sides of alternate digging buckets.



TRANSPORTATION OF WORKERS of Pacific Constructors, Inc. to Shasta Dam is speeded up by truck equipped with special body accommodating 48 men. This truckload of "swing-shifters" is on its way to build forms, thread pipe, blast rock, vibrate concrete and perform scores of other duties required to complete big concrete structure for U.S. Bureau of Reclamation in northern California.

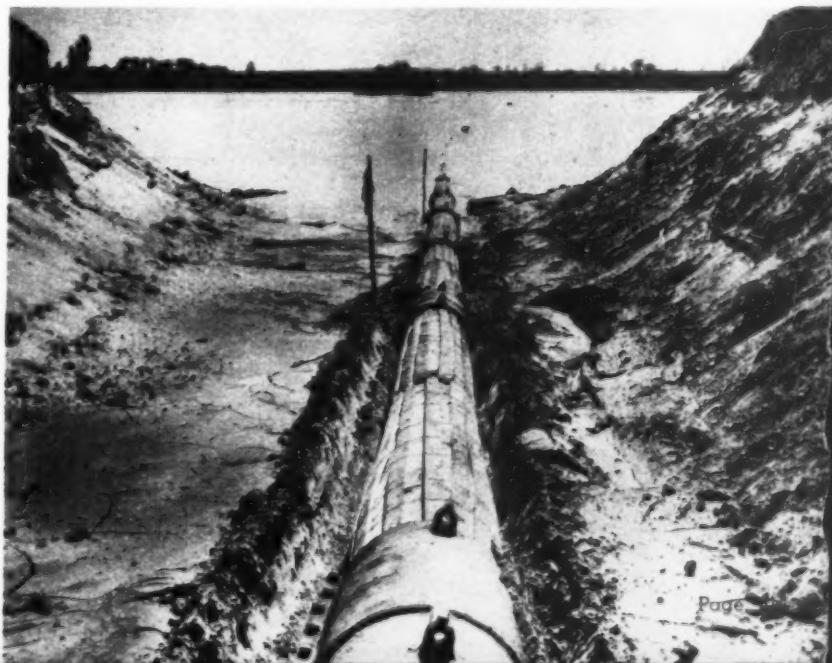
MOUNTED ON MOTOR TRUCK (below) to enable it to operate at higher level than could be reached from its own two-wheel carriage, is this Ingersoll-Rand wagon drill, boring horizontal blast holes in rock cut for new state highway in New Mexico. Setup also increased mobility of rig, which was owned by Henry Thygesen, Inc., contractor, of Albuquerque, N. M.—Photo from New Mexico State Artist Bureau.



BLOCKS OF MELTING ICE, each weighing 200 lb., were means employed by City of Augusta, Ga., to lower as unit 400-ft. section of 30-in. cast-iron main carrying water under pressure of 22 lb. per sq.in. Maximum vertical distance lowered was 26 in. Excavation was carried down under each pipe length, leaving earth plug under each bell to support line. From each plug enough earth was removed to allow for insertion of 200-lb. blocks of ice under each joint. Then remainder of earth plug was dug out, allowing weight of pipe to be carried by ice blocks. As ice melted under maximum temperature of 90 deg. F., pipe settled gradually and evenly to its new grade. Job of lowering was done in one day between 9 a.m. and 8 p.m. and required 3,900 lb. of ice. During operation, no leaks occurred, according to John D. Twiggs, assistant city engineer.

Photos Cast Iron Pipe News

OIL PIPE LINE IS WEIGHTED DOWN (below) at river crossing to prevent flotation. On under-water section of 24-in. welded steel pipe extending 550 mi. from Longview, Tex., to Norris City, Ill., heavy cast-iron saddles are clamped and longitudinal wood slats are wired to exterior to protect asbestos-felt wrapping as line is pulled across river in dredged trench.





Four Paving Machines

Lay Tar Concrete on Roads
for Naval Training Station



SPREADING-FINISHING MACHINE takes hot tar concrete discharged by dump truck and lays material to even grade.

Official Photos, U. S. Navy



TRACTOR-DRAWN SCRAPERS prepare grade for roads and paved areas at Naval Training Station. Side ditches and subgrade trenches are cut by these machines.

AFTER SUBGRADE TRENCH (below) has been excavated by tractor-scrappers, it is filled with stabilized gravel which is struck off and compacted to 8-in. depth as foundation for pavement.



WITH FOUR SPREADING-FINISHING MACHINES to lay tar concrete produced by a bituminous mixing plant at rates of 120 tons an hour for binder material and 100 tons an hour for top-course mixture, the John A. Johnson Contracting Corp. and the Mt. Vernon Contracting Corp. last fall made a good start on a schedule which contemplated placing 600,000 sq.yd. of black-top pavement in 80 working days as part of the two firms' general contract with the Bureau of Yards and Docks of the Navy Department for the new \$47,000,000 Sampson Naval Training Station on Seneca Lake, near Geneva, N. Y. Ahead of the tar-concrete paving crews, tractor-scraper grading outfits built the grade and cut the side ditches for 25 mi. of two-lane roads and a lesser mileage of single-lane secondary roads. On the grade, excavated by these machines to box section, the contractors placed stabilized gravel sub-base as a foundation for the pavement. In the two-lane roads, this foundation was built up with a base of stone macadam penetrated with tar before the binder course of tar concrete was laid.

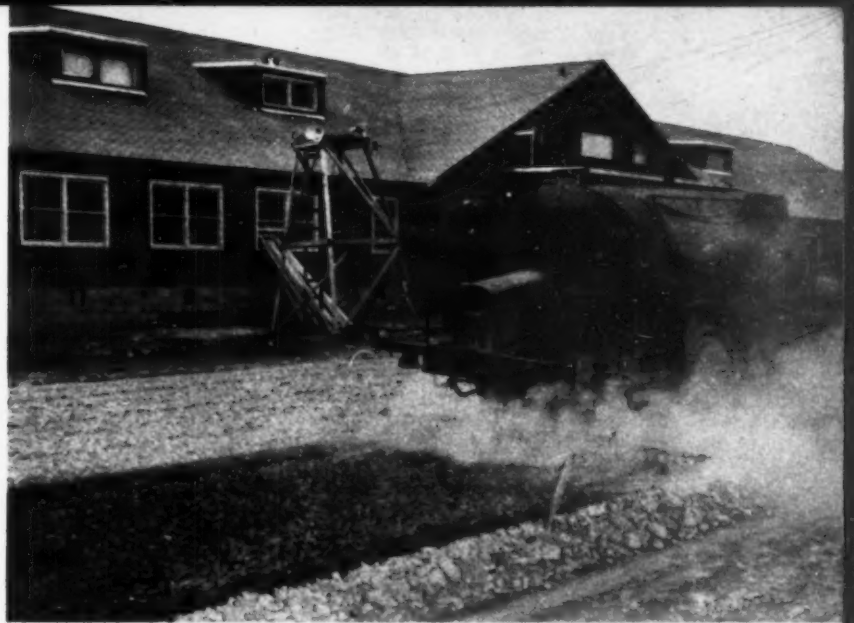
Paving quantities total 75,000 tons of tar concrete and

MOTOR GRADERS (below, right) maintain true, even grade on foundation material as it is spread and compacted.





STONE MACADAM BASE 3 in. thick is spread on stabilized gravel sub-base to be rolled and penetrated with hot tar



HOT TAR PENETRATION is applied to stone macadam base by pressure distributor at rate of $1\frac{1}{4}$ gal. per sq.yd.

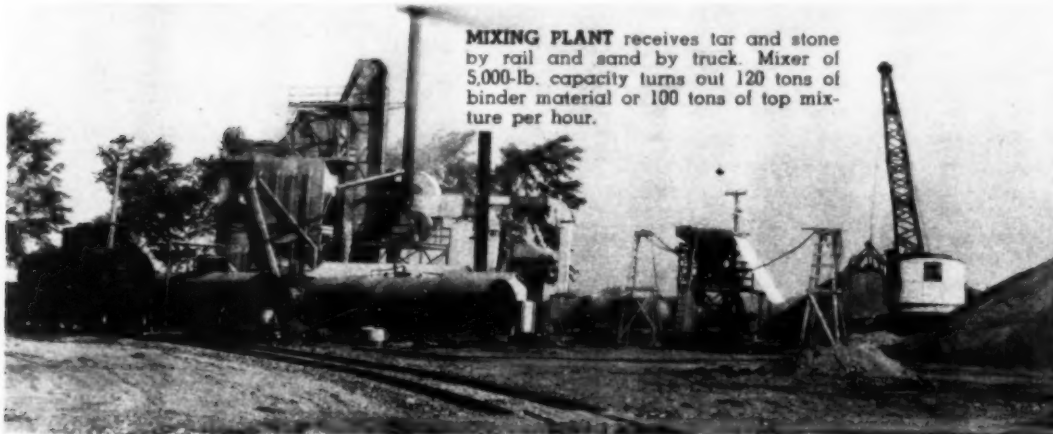
66,000 tons of stone for the penetration base. Roads are flanked by stabilized gravel shoulders which increase the quantity of stabilized material about 50 percent to a total of 300,000 tons. Skillful scheduling of deliveries by truck and rail kept these materials flowing into the job at the required speed without disrupting essential transportation of supplies going at the same time into buildings and utilities. All operations on project were closely coordinated to accomplish completion in six months of what is virtually a fully-equipped city for a population of 35,000.

To achieve this speedy completion, construction had to be started almost simultaneously on all features of the tremendous project, with primary emphasis on buildings and utilities, such as water supply and sewage disposal, which take longest to complete. In the initial phase of the job, temporary and existing roads on the site had to serve the construction of these facilities, and work on permanent roads and pavement necessarily was postponed until construction

(Continued on page 80)



TOP COURSE of plant-mix tar concrete is laid by black-top paving machine on binder course previously placed by same method.



MIXING PLANT receives tar and stone by rail and sand by truck. Mixer of 5,000-lb. capacity turns out 120 tons of binder material or 100 tons of top mixture per hour.



ON STONE BASE, following penetration with hot tar, rotating spreader attached to truck applies fine stone to fill voids.

ROAD AND PAVEMENT CONSTRUCTION at Naval Training Station progresses rapidly under supervision of: (Left to right) JACOB FELD, site project manager for contractors; HOWARD BAILEY, superintendent of road construction; and RICHARD HALTON, paving superintendent.



ARMY ENGINEERS AND CONTRACTORS COMPLETE

1,800-Mile Alcan Highway

IN RACE AGAINST TIME AND HEAVY CONSTRUCTION ODDS



TYPICAL SECTION of gravel-surfaced road in Tanana Valley, Alaska, is flanked at right by long poles with painted tips placed to serve as guides for winter traffic when snow blankets the highway.

MUDDY GLACIAL TILL imposes tough operating conditions on tractor-scraper outfits preparing sub-grade for road through cleared timberland.



By **HAROLD W. RICHARDSON**

Accredited War Correspondent for Construction
Methods and Engineering News-Record

"It can't be done . . . here it is."

That's the dramatic story of how the race against time and almost insuperable construction handicaps was won by completing in a single short working season the Alcan Highway, 1,800-mile military route penetrating the heavily timbered arctic wilderness of the Canadian Northwest and Eastern Alaska. Despite mosquitoes and other insect pests, mud, rains and floods, raging streams and broad rivers that had to be crossed, lack of transport, and shortages of equipment and materials, seven Army Engineer regiments, 54 civilian contractors, and a group of federal



BRIG. GEN. JAMES A. O'CONNOR, Corps of Engineers, head of Army's Northwest Service Command which includes Alcan Highway project, explains construction operations to Editor **HAROLD W. RICHARDSON**, author of accompanying article.

H. W. RICHARDSON'S STORY OF THE ALCAN HIGHWAY

● With the credentials of a war correspondent and under the sponsorship of the Corps of Engineers, U. S. Army, Harold W. Richardson, Western Editor of *Engineering News-Record*, recently completed for that publication and for *Construction Methods* a trip over the entire 1800-mile length of the Alcan Highway to obtain first-hand information and on-the-job photographs for descriptive articles. In the text herewith he tells how the gravel-surfaced traffic artery through the Northwest wilderness was built, in record-breaking time and despite almost insuperable difficulties,

through the joint efforts of the Army Engineers, the federal Public Roads Administration and American and Canadian contractors. Leaving Chicago Sept. 30, he proceeded first to Dawson Creek, B. C., and thence over every section of the newly opened truck route via Fort St. John, Fort Nelson, Watson Lake, Whitehorse and Big Delta, the present northern terminus of the military highway, with a connection to Fairbanks. His trip involved 9,782 miles of travel by train, airplane, boat, truck, motor car and Army "jeep" and required 45 days.

Mr. Richardson is the first person to have traveled over the entire length of the Alcan Highway and was present when eastbound and westbound bulldozer crews met to "hole through" the final section of the route at Beaver Creek in the Yukon on Oct. 25. His story, illustrated with many of the photographs he took with his own camera, in addition to those supplied by the Corps of Engineers and Public Roads Administration, is a graphic record of an outstanding construction feat that has contributed to America's war effort a vitally needed traffic artery destined to play as important a part in military operations here in the Western Hemisphere as did China's Burma Road. — Editor



"HOLING THROUGH" of Alcan Highway is accomplished at 5 p.m. Sunday, Oct. 25, 1942 as bulldozer crews working east and west on final section meet at Beaver Creek in the Yukon, 20 mi. east of Alaskan border. Standing in front of tractors they operated to close last gap in 1,800-mi. route, CORP. REFINES SIMS, JR. (left), of Philadelphia, with 97th Engineers, shakes hands with PVT. ALFRED JALUFKA, of Kennedy, Tex., with 18th Engineers.



THOMAS H. MACDONALD AND JAMES S. BRIGHT, respectively commissioner and engineer in charge for Public Roads Administration of Federal Works Agency discuss engineering phases of Alcan Highway project.



ROUTE OF ALCAN HIGHWAY, covering total length of 1,800 miles, starts at railhead in Dawson Creek, British Columbia, and extends northwest to Alaskan terminus at Big Delta where existing route connects with Fairbanks.



FRONT LINE OPERATIONS involved clearing right-of-way by using bulldozers as "shock troops" to push over shallow-rooted trees and open way for subsequent grading and surfacing.



PRA FINAL TYPE SECTION of road north of Fort St. John is 36 ft., with gravel surface. Construction of this type of highway was stopped in August to permit contractors to concentrate efforts on improving army's pioneer road.



WHERE MUSKEG OR SWAMPY AREAS could not be bypassed, road was carried across soft spots on corduroy mats made from trunks of trees felled along right-of-way.

CONTRACTOR'S BLADE GRADER (below) hauled by tractor does final shaping up of gravelled road surface along picturesque mountain lake.

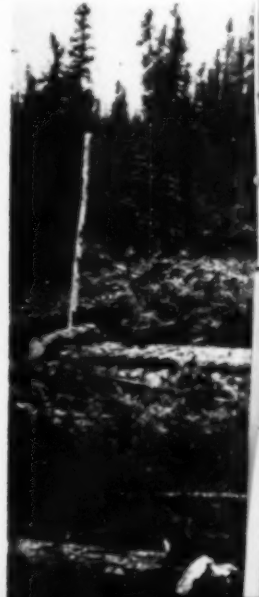


highway engineers have performed a construction miracle by which military traffic is now rolling from British Columbia through the Yukon and into central Alaska over a gravelled surface that is destined to play a major role in America's war effort.

The project, begun last spring, was completed, dedicated and placed in service Nov. 20, far in advance of even the most optimistic expectations. While the minimum surfaced width is 18 ft., the road for most of its length has a gravelled surface from 22 to 24 ft. wide and every stream along the line has been crossed by a pile trestle. This achievement, the greatest construction feat since the Panama Canal, is a tribute to the courage, skill and resourcefulness of the U. S. Corps of Engineers' officers and troops, American and Canadian contractors, the federal Public Roads Administration, under whose direction the contractors operated, and to the high quality and efficiency of American construction equipment.

The Alcan Highway, as shown on the accompanying map, starts at Dawson Creek, British Columbia, 500 mi. northwest of Edmonton at the end of a branch-line railroad. There is only a poor country road connecting Edmonton with Dawson Creek, so all construction and military supplies had to be hauled to Dawson Creek by rail. From Dawson Creek north to Fort St. John, 52 mi., there existed a country road, now

GOVERNOR ERNEST H. GRUENING (below) of Alaska confers with COL. JOHN W. WHEELER, engineer officer in charge of entire Alcan Highway project.



Highway . . . Continued



BRIG. GEN. CLARENCE L. STURDEVANT, Assistant Chief of Engineers, U. S. Army, is in charge of engineer troops.



COMPLETED SECTION of gravel-surfaced army road is 24 ft. wide and carries two lines of traffic at location along Liard River.



BULLDOZERS PUSH GRAVEL for road surfacing over "trap" from which it falls by gravity into trucks for delivery to road.



"WINTERIZED" JEEP inclosed with tarpaulins and piloted by **CAPT. M. L. SPRIGG**, of 97th Engineers, transported War Correspondent Richardson over many miles of the Alcan Highway route.

PERPETUALLY FROZEN GROUND (below) is insulated by placing cover of felled trees and brush across roadbed (**left**) and covering with fill of unfrozen earth to serve as base for surfaced road (**right**). To obtain unfrozen material for fill and gravel surfacing it was necessary in some cases to haul 18 mi. from river beds.





ELEVATING GRADER builds up subgrade of section which has been cleared of timber.



HEAVY GOING THROUGH ALASKAN MUCK is encountered by army supply truck which is pulled through morass by two big tractors.



ACROSS TRESTLE BRIDGE which Engineer troops built by hand, using unsawed local timber, heavy equipment moves up to front of line for grading road.



TYPICAL POLE BRIDGE is built by hand across Steamboat Creek, using timber felled alongside site.



BEFORE BRIDGES WERE BUILT trucks carrying diesel fuel for construction equipment and other necessary supplies had to ford streams hub-deep.



AT ROADSIDE GRAVEL PIT power shovel loads truck which delivers material to road for surfacing.



AT SEAGWAY, seaport on southern Alaska coast, barges carrying construction equipment are beached at low tide and unloaded by crawler crane for transshipment by rail to Whitehorse. Crane walks down beach at low tide, picks up truck and returns to railhead.



ALONG COMPLETED ROAD contractor's piledriver is moved to another location where bridge is to be built across stream.



ROADSIDE REPAIRS of construction equipment are made with aid of motor trucks equipped with welders and other repair tools.



FIELD LUBRICATION is handled on the job by special service trailer carrying greasing equipment, here shown operating on a tractor.

improved to high standards. From Fort St. John north is all new construction—to Fort Nelson, then westward to Watson Lake and Whitehorse and northwest to Big Delta, Alaska, where the Alcan highway connects with the much improved Richardson Highway at a point 88 mi. south of Fairbanks. A branch of the Alcan Highway swings south to meet the Richardson Highway again at Gulkana, 130 mi. from Valdez on the seacoast. The Alaska Road Commission, which has been building and improving the Richardson Highway from Valdez to Fairbanks for several years, has just completed a 200-mi. connection between Gulkana and Anchorage. Thus the Alcan Highway taps the interior of Alaska at Fairbanks and at the important coastal areas of Valdez and Anchorage.

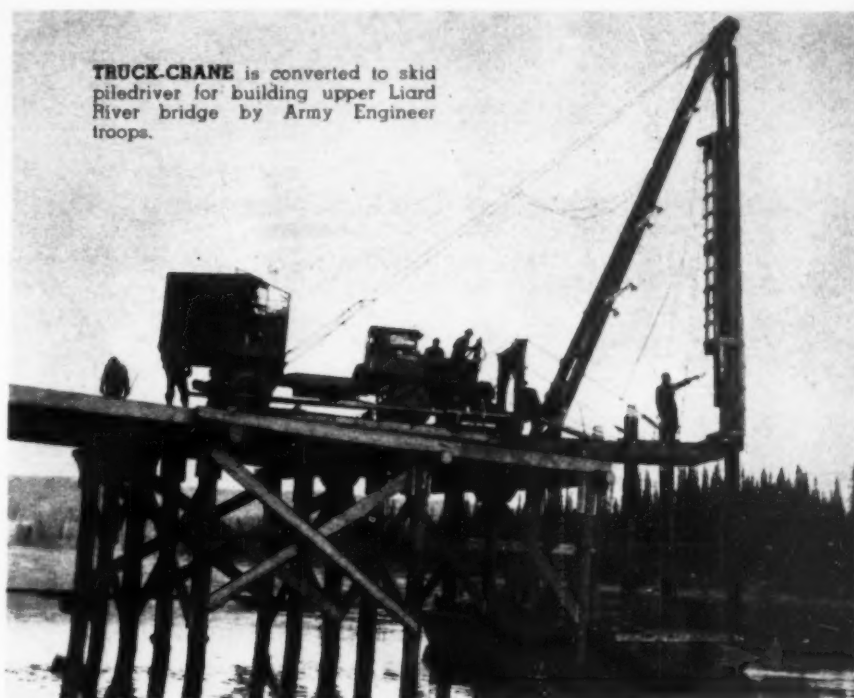
Original Plans Revised

The Army Engineers were originally sent to the project to "build a pioneer or trail road with all speed within the physical capacity of the troops and to a standard merely sufficient for the troops to sustain themselves." The Public Roads Administration was given the job of building the main road under instructions from the army to follow highway specifications for construction in national parks and forests, 1941 standards, which means a 70-mile-an-hour route. Under such instructions the road was started late last spring, although construction really did not get into full stride until almost the first of July. By the first of August, army officials realized that there would be no possibility of using the road for military traffic this winter unless the procedure was changed. Therefore, they ordered the PRA to shift its contractors from the main or final type road over on to the army road to assist the troops in improving the pioneer road sufficiently for truck traffic. As each Engineer regiment finished its allotted section of pioneer road, it dropped back to work with the

(Continued on page 90)



FROM DEEP RIVER CROSSING tractor emerges with aid of hauling line which pulls it up bank of stream.



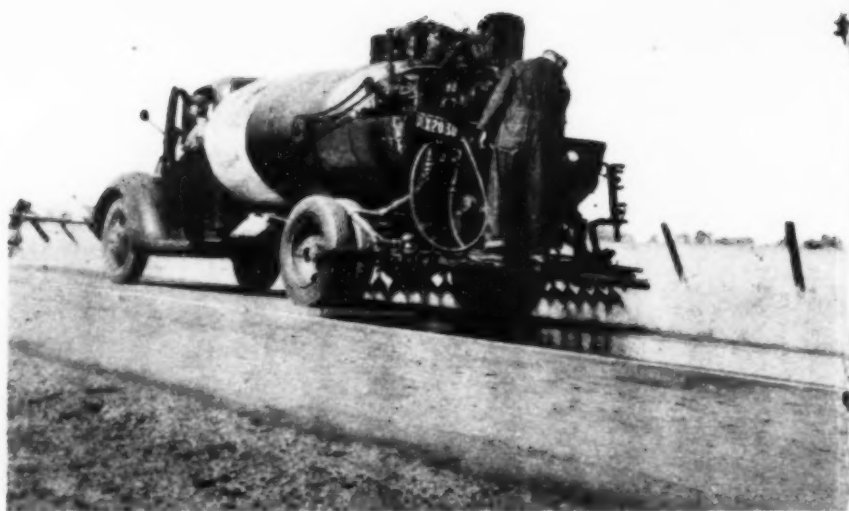
TRUCK-CRANE is converted to skid piledriver for building upper Liard River bridge by Army Engineer troops.

IMPROVISED JIB BOOM (below) sets trestle bents for timber bridge at river crossing.





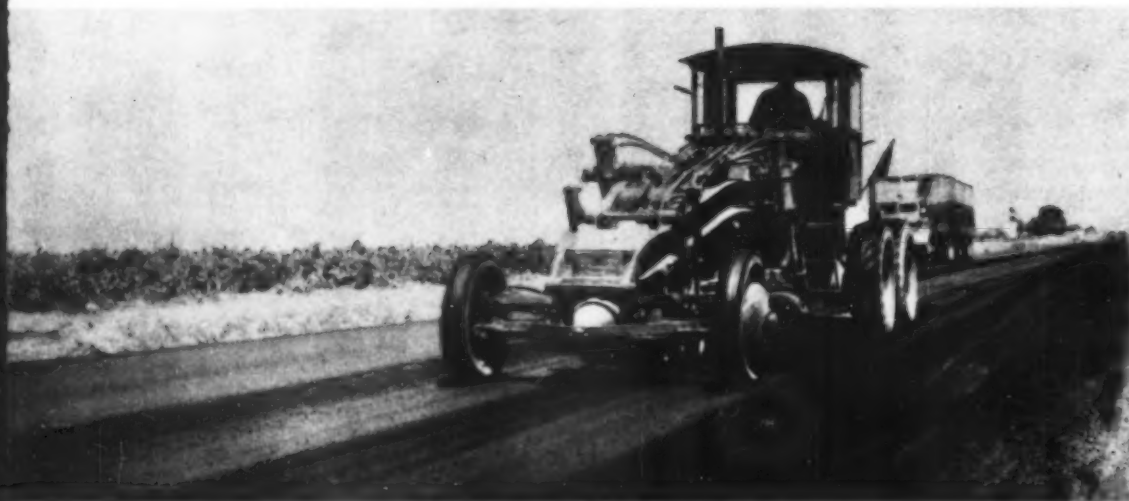
FIRST STEP in rebuilding road calls for excavating shoulders to 6-in. depth alongside concrete slab and filling trenches with gravel compacted in layers by roller to provide base for pavement widening. Gravel is watered by sprinkler truck during rolling, and surface of completed gravel strip is primed with liquid asphalt.



LIGHT TACK COAT of emulsified asphalt is applied by pressure distributor to surface of old concrete slab between primed widening strips.

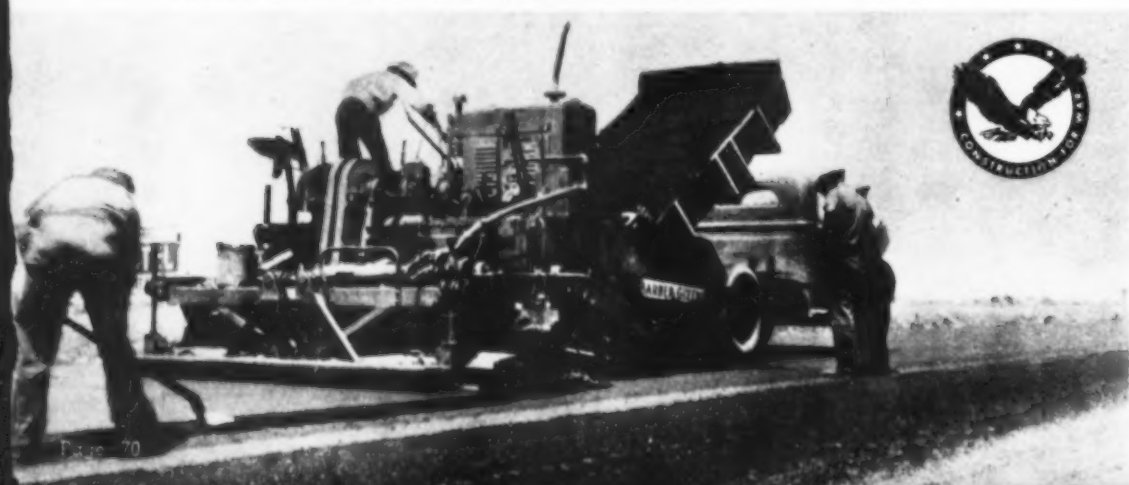
California Maintenance Forces Restore *War-Battered Roads*

By T. H. DENNIS
Maintenance Engineer,
California Division of Highways,
Sacramento, Calif.



POWER GRADER spreads leveling course of oil-treated plant mix across full 22-ft. width of concrete slab plus compacted gravel border strip.

TOP COURSE (below) of oil-treated plant mix is laid by tamping-leveling finisher. Average depth of two-course surfacing for widened pavement is about 1½ in.



DECLARATION OF WAR upon Japan in December of 1941 focused attention on the military needs of the Pacific Coast States. Almost overnight construction was started on a large number of airfields, army cantonments, shipyards and civilian housing projects. This construction made its immediate demands on the lumber industry and the development and production of construction materials, such as cement, sand and rock. Transportation of these materials was in the main by truck, with the result that an unexpected volume and tonnage of traffic was thrown upon roads never designed for such usage in the California state highway system.

A survey of the situation during the first months of 1942 indicated that repair work and major reconstruction totaling in excess of \$5,000,000 were required as a result of these activities in 22 of the 58 counties. This figure does not include expenditures made on access roads or reconstruction planned prior to the development of the present emergency, nor does it include the expenditures necessary to hold the rapidly failing sections in service until the major restoration projects could be undertaken.

Attempt To Let Contracts

At first, attempts were made to contract many of the larger repair jobs. This action met with only fair success



PNEUMATIC-TIRED ROLLER and loaded trucks give final compaction to top course of oil-treated plant-mix surface.



TO STRENGTHEN SHATTERED CONCRETE PAVEMENT for use as base in reconstructed road, trucks dump blanket of gravel on existing slab. Border trenches are excavated for widening base with compacted gravel.

as bids, in some cases, were greatly in excess of the engineer's estimate and the funds available. In some instances no bids on the proposed work were received. These conditions were true generally of projects in the outlying areas where procurement of labor and materials was uncertain. Consequently, a considerable number of these repair and reconstruction projects were undertaken by our day labor forces.

Typical examples of the damage to pavements caused by concentrated hauling to military establishments and by the increased volume of commercial hauling is illustrated in accompanying photographs.

Step-by-step procedures for repairing two of these damaged highway sections are shown by accompanying photographs. The first five photographs illustrate the repair of an inland valley highway which consisted of a 15-ft. by 5-in. portland cement concrete pavement bordered with oiled earth shoulders. Prior to the war, this road satisfactorily served an average traffic of 1,500 vehicles per day. The construction of an airfield adjacent to the highway so greatly altered both the character and volume of traffic that the pavement was rapidly pounded to pieces. The thin oil-treated borders likewise became inadequate, from the standpoints of both economic maintenance and traffic safety.

Resurfacing Damaged Concrete

Immediate repair of this road was carried out in the following manner:

- (1) Existing borders adjacent to the pavement were bladed out to a 6-in. depth for a width of 3 ft. 6 in., back-filled with gravel and primed with an application of SC-1 or SC-2 liquid asphalt at the rate of $\frac{1}{4}$ gal. per sq. yd.
- (2) Shattered areas of the existing pavement were removed and replaced with oil-treated plant-mix material.
- (3) The pavement surface then was tack-coated with an application of emulsified asphalt at the rate of 0.10 to 0.05 gal. per sq. yd.
- (4) Both pavement and constructed borders then were surfaced with oil-treated plant mix placed in two courses. The total depth of blanket course varied depending upon the condition of the existing pavement but, in general, averaged about $1\frac{1}{2}$ in. A leveling course was placed first with power graders, and the

top course was laid with a mechanical spreader-finisher.

Another typical repair which involved strengthening of the existing road for use as a base is illustrated by pictures showing the treatment applied to an oiled concrete surface subject to heavy intra-state trucking. Normal traffic on this road ranged from 2,900 to 3,800 vehicles per day. The construction procedure for this road follows:

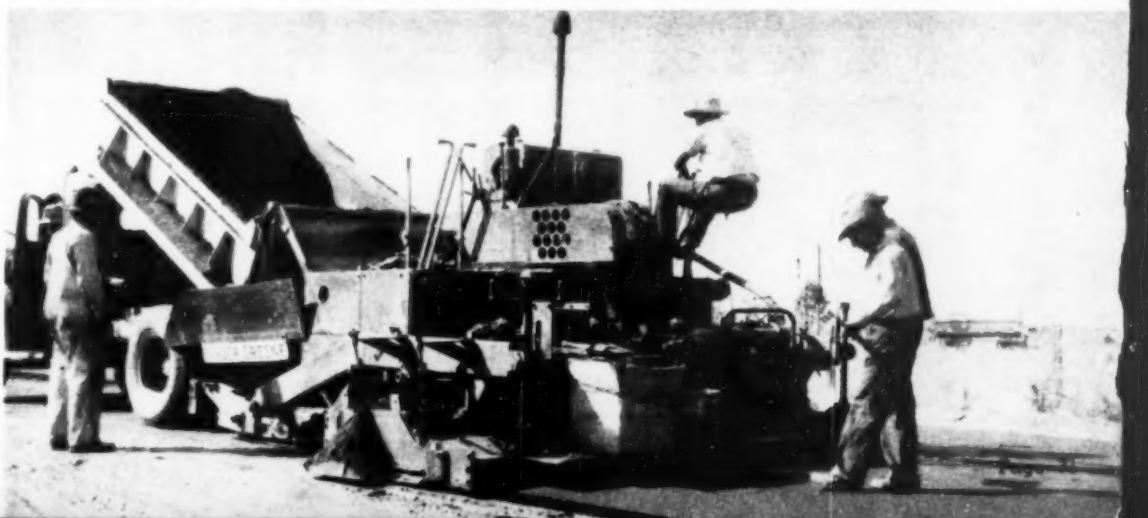
- (1) The existing shattered pavement was blanketed with local pit-run or screened gravel to a minimum depth of 4 in.
- (2) The gravel course was consolidated and primed with an application of SC-1 liquid asphalt at the rate of $\frac{1}{4}$ gal. per sq. yd.
- (3) The primed gravel base was then covered with a bitumin-

(Continued on page 130)



GRAVEL BLANKET spread by patrol graders is compacted with power rollers to minimum depth of 4 in. over old pavement. Border trenches along edges of concrete also are built up with compacted gravel. Traffic continues to use road during all stages of construction.

ON TOP OF FIRST-COURSE (below) of bituminous plant mix spread by power graders over full 22-ft. width of compacted gravel, mechanical finisher lays second course of plant-mix material delivered by dump trucks to hopper of machine. Total depth of two-course surface averages 2 in.



Flight Strip UTILIZES LOCAL MATERIALS



WORKING FACE of sand pit indicates natural material used as aggregate in sand-asphalt paving mixture.

Photos from M. M. Todd



NATURAL SOURCE of clay-sand-gravel yields stabilized material which is mixed in shovel bucket by skillful loading. This pit provides 30,500 cu.yd. of mixed material for stabilized construction on flight strip.



CLEAN SAND of proper gradation obtained from natural deposit at asphalt plant location is dumped into hopper from which bucket elevator feeds material into dryer.



TRACTOR-SCRAPERS of 16-yd. capacity, loaded with aid of pusher tractor, transport heaped buckets of sandy soil on flight strip grading operations. Pusher plates attached to front ends of tractors add useful weight to these high-powered diesel machines.

RELATIVELY LIGHT GRADING (below) puts 8,000x500-ft. area into shape for construction of flight strip with desirable gradients in longitudinal and transverse directions.



ON PREVIOUSLY COMPACTED SUB-BASE (below) 10 in. thick, trucks dump stabilized clay-sand-gravel mixture to be spread by bulldozers for 8-in. runway base.



FOR SAND-ASPHALT RUNWAY



SHOULDER is lightly scarified and seeded for grass cover to aid camouflage and hold surface against wind and water erosion.



FARM DISK HARROW drawn by wheel tractor manipulates clay-sand-gravel mixture to obtain optimum moisture for compaction of stabilized base.



ROTARY TILLER equipped with spring tines on rotating shaft is driven by power takeoff from tractor to which tiller is attached when it mixes and pulverizes stabilized material on runway. Rear panels of rotary tiller have been raised to expose spring tines. At right stand JAMES E. COURTNEY (with hat), superintendent for contractors, and ALBERT E. BAREFORD, foreman.



MOTOR PATROL GRADER trims 8-in. base of clay-sand-gravel compacted by sheepfoot tamping rollers to support runway wearing course.

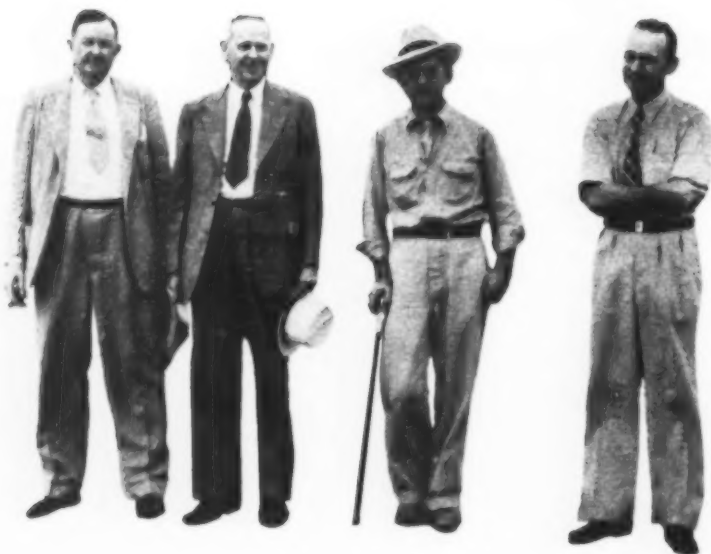
BY CAREFUL SELECTION of a site for a flight strip within an area designated by the Army Air Forces on the Middle Atlantic Seaboard, the Public Roads Administration of the Federal Works Agency and the cooperating highway department of the seaboard state obtained favorable conditions for economical contract construction of a project featuring a sand-asphalt runway on a stabilized base. Availability of materials within 6 mi. of the chosen location made it possible for the contractors to enter a low bid for this type of runway construction, and other characteristics of the site, including good topography, drainage and soil, contributed to the overall economy of the flight strip and



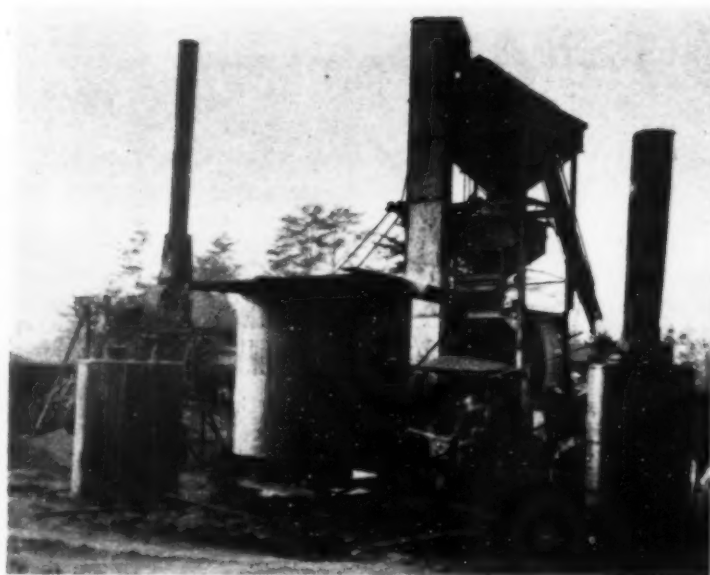
PRESSURE DISTRIBUTOR primes stabilized base with 0.35 gal. per sq. yd. of RT-3 to prepare subgrade for sand-asphalt wearing course.

PRIMED BASE (below) is flanked by selected topsoil shoulder which already has been seeded to grass





FLIGHT STRIP INSPECTION during construction brings together: (Left to right) PAUL CARRIGER, associate highway engineer, Public Roads Administration; FRED E. SCHNEPFE, director, Flight Strips Division, PRA; J. C. SHELHORSE, inspector for state highway department; and M. M. TODD, resident engineer, state highway department.



ASPHALT PLANT equipped with 5-ton mixer of revolving closed-drum type produces sand-asphalt for runway wearing course.

permitted the constructors to complete the project with minimum drain in critical materials, manpower and transportation. Concrete drain pipe, tar for priming stabilized base and asphalt for the paved surface, 1 3/4 in. thick, were the only products which had to be transported from a distance. Local pits furnished clay-sand-gravel mixture for the base and sand aggregate for the asphalt pavement.

Selection of the site was made in accordance with the same procedure which has been applied in locating most of the flight strips in the \$10,000,000 program authorized by the 1941 Defense Highway Act and discussed by Col. Stedman Shumway Hanks, of the Army Air Forces, in *Construction Methods*, May, 1942, page 53. The Army Air Forces first marked out an area in which a flight strip was wanted for strategic reasons; areas thus designated for flight strips ordinarily have taken in about 100 sq.mi. of territory. Within the prescribed area, engineers of the PRA district office and of the state highway department investigated sites which would meet the requirements for military operations during the war, and, in addition, would satisfy the further

(Continued on page 100)



HOT SAND-ASPHALT for runway wearing course is dumped from truck into hopper of tamping-finishing machine which pushes truck ahead as it spreads and compacts material to 1 3/4-in. thickness.



STATE HIGHWAY relocated to bypass flight strip requires 54,000-cu.yd. fill in 500 ft. across muck deposit at this point.



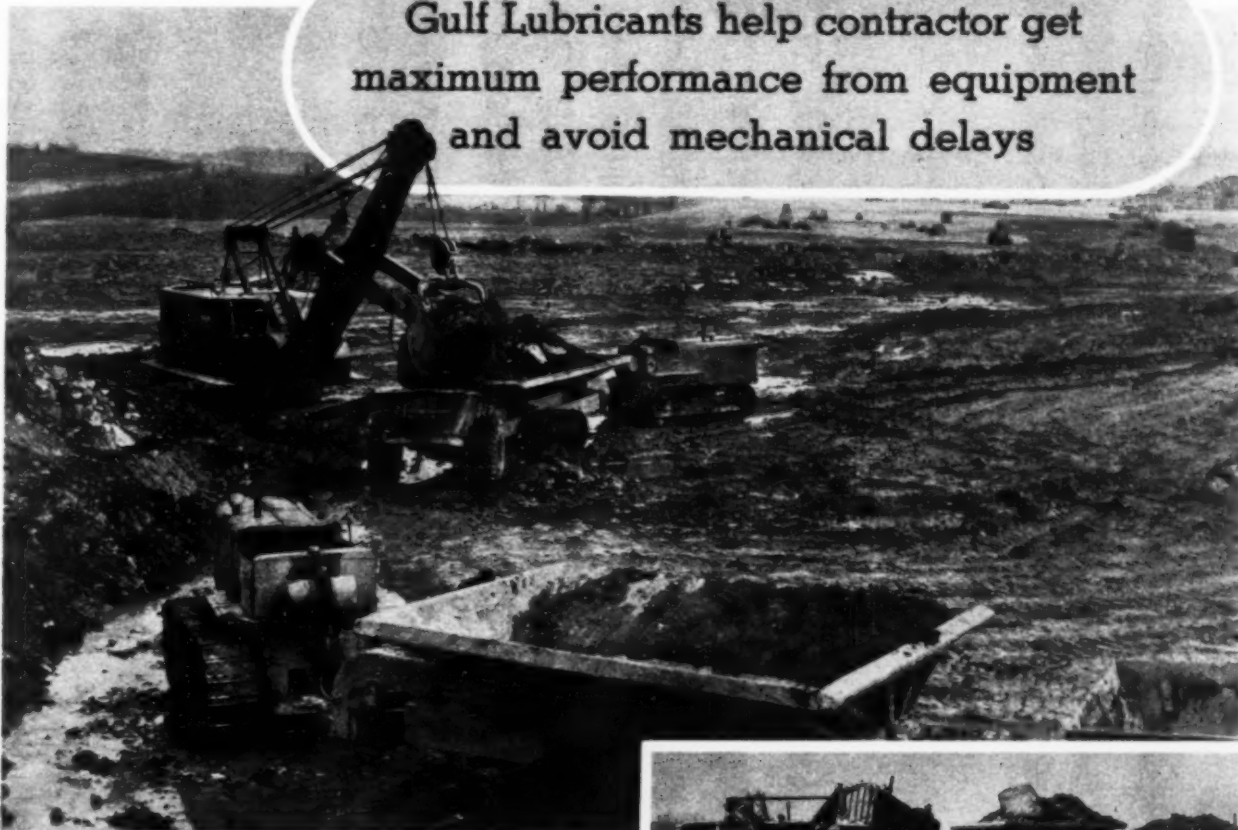
TANDEM 10-TON ROLLER applies final compaction to sand-asphalt wearing course and irons out joints between lanes behind spreader-finisher.



PLACING SUCCESSIVE LANES 10 ft. wide for runway pavement 4,000 ft. long by 150 ft. wide, tamping-leveling finisher lays sand-asphalt at prescribed rate of 175 lb. per sq.yd.

Huge airport project 3 months ahead of schedule —

Gulf Lubricants help contractor get
maximum performance from equipment
and avoid mechanical delays



*Ralph Myers Construction Company, Salem, Indiana, is three months ahead of schedule on a huge military airport project, located in Western Pennsylvania. The \$2,500,000 contract involves moving 5,000,000 cubic yards of earth and rock. Gulf quality lubricants are helping this contractor get efficient, trouble-free performance from the many units of modern equipment employed.



OUR equipment has made an exceptional performance record on this job with Gulf lubricants in service—one of the important reasons we are months ahead of schedule,” says airport project contractor.* “Proper lubrication has helped us get the most out of each unit and avoid unnecessary operating delays — which means more dirt moved on every shift.”

Now that spare parts and new equipment are so difficult to obtain, many leading contractors use Gulf products as job insurance. For they have learned from experience that Gulf quality lubricants provide an extra margin of protection

against breakdowns and mechanical troubles—and that Gulf quality motor fuels help them obtain more efficient performance from their equipment.

You, too, will find it pays to use Gulf quality products on your next contract. They are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.



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GULF REFINING COMPANY
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America needs scrap iron and steel . . . millions of tons of it . . . the war can't be won without it. Every mill, factory, shop, mine and other organization of American industry must contribute every available pound of scrap metal to the nation's war effort. Make your clean-up complete . . . in your home and at your plant. Do your share to get all the needed scrap into the fight.

Clyde Whirleys have proven to be ideal machines for moving scrap. In the same way they handle coal, sand, gravel or any other kind of material at industrial plants, loading stations or on construction jobs . . . efficiently and economically.

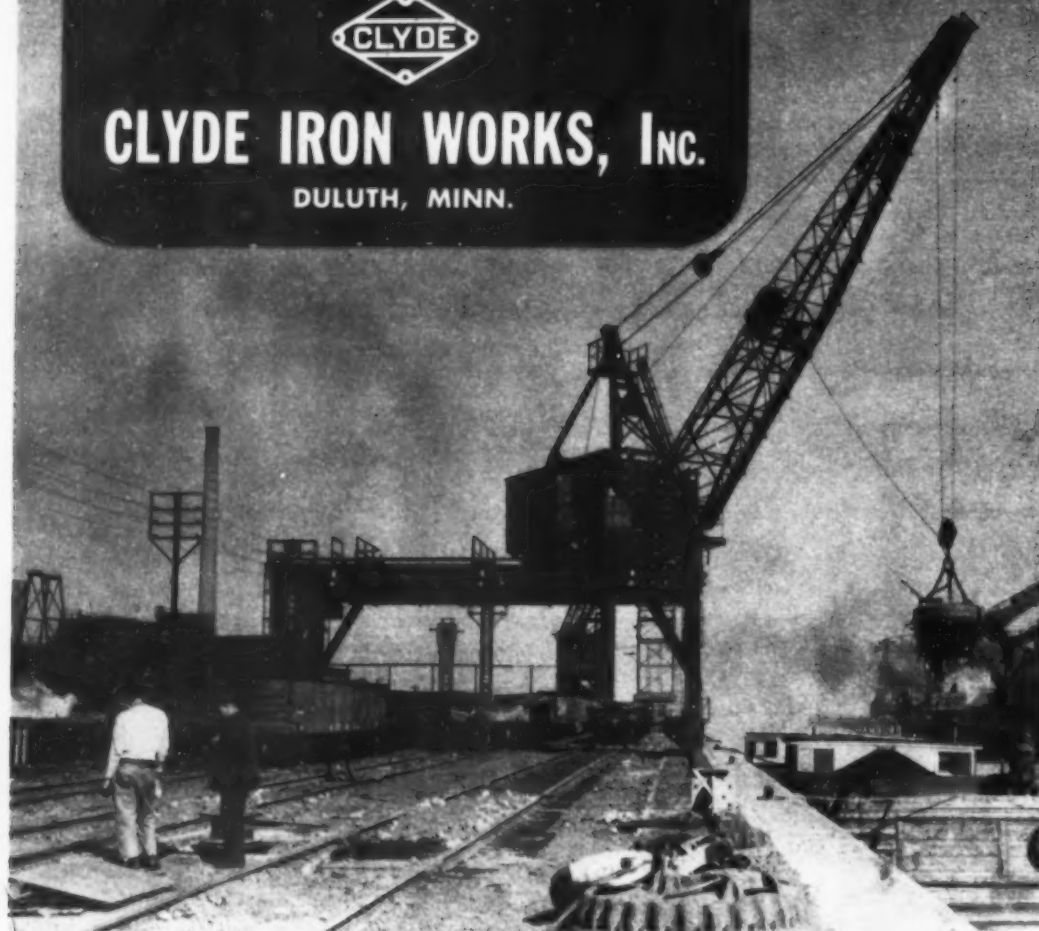
The long reaching booms of Clyde Whirleys, cover an exceptionally large area . . . their balanced design results in smooth and fast swinging with no strain on the center pin. Clyde's equalized wheel arrangement on the turntable insures against individual wheel overloading as the load on each wheel can be definitely determined.

Seven standard sizes to choose from with lifting capacities from 22,000 lbs. at 150 ft. to 140,000 lbs. at 35 ft. boom radius.



CLYDE IRON WORKS, Inc.

DULUTH, MINN.



Access Roads

(Continued from page 45)

reporting for work because of traffic jams. Instances have been reported where a portion of a plant shift actually gave up trying to reach the plant and went home.

Because of the urgency of the situation, many difficulties have been overcome, 120 projects aggregating 240 mi. in length have been completed and 888 projects exceeding 4,000 mi. in length are under construction or approved for construction.

The Michigan highway department assigned 74 percent of its engineering staff to work in the region of the Willow Run Bomber Plant. When Texas, Louisiana and other states did not get bids for construction of access roads they assembled equipment and did the work by force account. Where plants were being built or were already in operation, the daily movement of workmen and flow of materials had to be maintained. Specific instructions were given that traffic jams should not be caused by construction operations and that adequate detours be provided wherever needed.

Much work was done during severe winter weather. The immediate need for use of the roads justified the cost of heating aggregates and water and protecting subgrades against freezing by covering with straw.

Designs Changed

Designs and construction practices have been altered to meet changed conditions, sometimes at increased cost, but generally without sacrifice in substantial character of work. Designs for concrete road slabs were revised to eliminate all but the most essential steel reinforcing, following practices suggested by the American Association of State Highway Officials. After control over the use of bituminous materials was applied, first in the eastern seaboard states and later extended over the entire country, plans were examined critically before authorizing the purchase of either asphalt or tar.

Metal for culvert pipe, hand railing, lighting fixtures and signs passed rapidly from the "hard to get" to the "fresh out of stock" stage.

The impact of the steel shortages fell most heavily on plans for structures. This was a new kind of impact for the bridge engineers, but they have dealt with it successfully in many different ways. They have redesigned their structures to use mass concrete for substructures, plain concrete for arches; span lengths have been shortened to reduce the amount of steel, and timber has been widely used both for trusses and in combination with other materials.

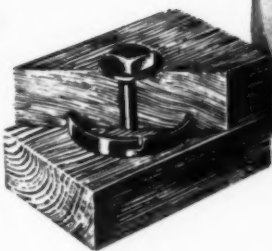
For an important bridge in Ohio

(Continued on page 78)

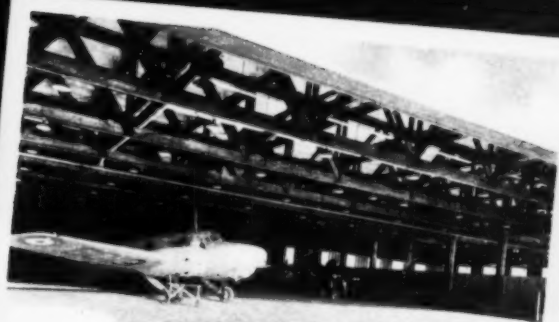


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The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.



Timber ENGINEERING COMPANY
WASHINGTON, D. C. PORTLAND, OREGON



Behind the man in the Bomb Bay, the American Forest fights. This typical double hangar, timber engineered with TECO-connected timber trusses, houses Uncle Sam's fighting war birds. You also, can now have clear-span timber trusses—as wide as 200 feet.
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Model "67" SKILSAW trims off sheathing around doors and windows faster... trims off floor and roof decking.



Model "67" SKILSAW speeds up cutting of compositions and Celotex (above)... quickly saws openings for vents and staircases (below).



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COUNTS FOR MORE

USING SKILSAW TOOLS!

A sure, economical way to speed up War Construction is to use Model "67" SKILSAWS on every job. Spotted conveniently around each project, these SKILSAWS not only make countless cuts quicker but save extra time by saving steps — help fewer men get more work done.

Model "67" is LIGHT (only 11 lbs.) for easy one-hand operation on ladders and scaffolding... COMPACT for close-quarter sawing anywhere... POWERFUL for faster cutting on 1 7/8 in. lumber and compositions, for quickest light scoring in stone and tile. Keep them right at hand on every job. No other extra equipment offers so much building speed at so low a cost (only \$75.00) and you can get Model "67" SKILSAWS promptly for real time savings on your present war work. Ask for a demonstration.

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SKILSAW TOOLS

PORTABLE
ELECTRIC

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(Continued from page 76)

plans had been prepared for a 3-span steel deck plate girder. Revised plans called for a continuous reinforced concrete deck girder with a reduction in use of steel from 330,000 to 149,000 lb.

At Newport News, Va., a bridge is needed to carry war traffic on a city street over the C.&O. railroad tracks. Timber bents are to be used for the approaches, but I-beams are needed for 50 and 54-ft. spans over the tracks. The needed 58 tons of steel I-beams are to be assembled from three old bridges dismantled in different parts of the state.

In Mendocino County, Calif., the Albion River is crossed on a viaduct nearly 1,000 ft. long and 150 ft. high. The approaches are mainly 38-ft. deck timber trusses, supported by timber towers on concrete pedestals. The river channel is spanned by a 130-ft. steel truss salvaged from another site and reconditioned for use.

War Needs Served

The importance and urgency of the access road program can be indicated by a few examples selected from the 1,000 projects either completed, under construction or approved.

Many new highways have been needed to open up new sources of raw materials for manufacture into tools of war. Tool steel requires vanadium. Southwestern Colorado produces in widely scattered deposits 95 percent of vanadium ore mined in the United States. Five roads connecting Colorado's vanadium deposits and aggregating 159 mi. in length have been completed or are nearing completion.

A large airplane plant in the East has increased in size almost tenfold recently. Thin-surfaced roads in the vicinity, previously carrying fewer than 5,000 vehicles a day, carried in 1941 more than 10,000 vehicles daily. Traffic congestion slowed both traffic and plane output. A system of modern, high-speed roads to serve this plant is almost completed. The time required for employees to reach the plant has been cut in half. A modern system of multiple-lane roads to supply the needs of a steel company and shipyards in the same general area will be completed soon.

A West Coast shipbuilding company made a notable record for the delivery of Liberty ships. Early in 1941, about 9,000 men were employed by the company. Early in 1942, about 24,000 men were employed with 36,000 anticipated. Traffic congestion near the yards delayed workers and movement of material. On recommendation of the Navy Department, two additional highway lanes were constructed to the plant. They are financed with federal access road funds and state funds.

In or near one of our ports on the Atlantic Coast are numerous airfields and eight major bases or supply depots for armed services. Thousands of enlisted men and of workers have been

(Continued on page 80)

America Has A New "Main Street!"

It's the Alaska-Canada Highway, but it's Main Street for it's the *main* reason why the Japaneses won't rename it "Alaskakuo" and set up a puppet emperor over it.

You'll find Buckeye Clippers—the convertible shovels with vacuum power control—working along Main Streets in cities all over America and in gravel pits, material yards and on excavating jobs just off Main Street. And Buckeye Clippers made the dirt fly on America's new "Main Street." Subarctic weather is their meat—extreme heat or cold doesn't affect *vacuum control*.

Model 70 $\frac{3}{4}$ yd. Clippers were used, one of which is shown above. They're on many other vital war projects, too. It's Vacuum Control for Victory!

BUCKEYE TRACTION DITCHER CO.

"Part of the Arsenal of Democracy"

Findlay, Ohio

It's a people's war
—defend your
Liberty by buy-
ing war bonds.



How to Make Your Shovel Last Longer!

1. Keep dipper teeth sharp. (Saves fuel, oil and maintenance; increases production.)
2. Keep all parts well lubricated and clean. Accumulation of dirt gets into the moving parts and causes excessive wear and damage.
3. Don't abuse your shovel—lifting loads beyond its capacity—piling on extra counterweight—careless and rough operation.
4. Don't allow cables to cross wrap on the drum.
5. Keep crawler treads adjusted properly.
6. Don't use abrasive material on clutches and brakes. If grease gets on the linings, clean with gasoline.
7. Keep all joints on the vacuum system tight.
8. Change the oil in the motor crank case regularly.
9. Clean air cleaner regularly.
10. Use clean water in the radiator—flush it out occasionally.

Built by Buckeye

Convertible Shovel



Trenchers



Traction Equipment



K-B Finegraders



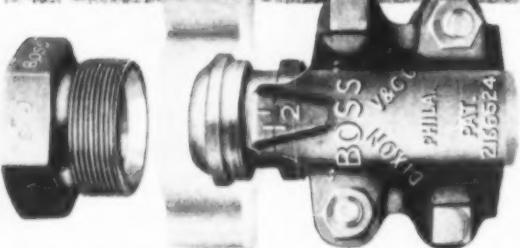
Road Wideners



Spreaders



Contributing to Speed and Safety on the BIG Construction Jobs!



"GJ-BOSS" Ground Joint FEMALE HOSE COUPLING, STYLE X-34

For steam, air and hydraulic hose. Washerless construction provides leakproof, trouble-free seal between stem and spud. Strong malleable iron "BOSS" Interlocking Offset Clamp has great gripping power—no danger of blow-offs. Swivel wing nut facilitates connecting and disconnecting. SIZES: 1/2" TO 4", INCLUSIVE.



"GJ-BOSS" Ground Joint AIR HAMMER COUPLING

Same washerless construction as Style X-34 coupling, above. No lost or mislaid washers to replace. "BOSS" Interlocking Clamp anchors coupling to hose with powerful, evenly distributed hold. COMPACT TYPE, STYLE XHB-61, 1/2" AND 3/4". HEAVY TYPE, STYLE XHB-72, 3/4" AND 1".

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(Continued from page 78)

brought to the area. Roads in the area had been laid out in the days of sailing vessels and horse-drawn vehicles. For movement of troops, workers and supplies it was necessary to straighten and widen old roads and to construct new routes. At present, 47.6 mi. of access road so designed as to be of permanent value are under construction at an estimated cost of \$6,235,000, of which federal funds will amount to \$5,500,000. State and local authorities are providing the remainder.

Another port on the Pacific Coast has naval bases and training stations, army reservations, airplane factories, and new housing projects at its very door. At times, streets are almost completely blocked by thousands of vehicles driven by war workers, soldiers, and sailors. Five major projects to provide 4- and 6-lane roads through the congested area at a cost of \$6,000,000 were under construction or about to be put under construction at the end of the fiscal year.

The accomplishment of the state and federal road building agencies in planning a large program of highway construction and in overcoming many obstacles in the way of construction operations has been accepted as expected performance. This in itself is a tribute to efficient operation the federal-state road building organization developed from years of experience in federal-aid road construction.

The federal government is paying 93 percent of the cost of the program, but engineers of the state highway departments have made the surveys, prepared plans, and supervised construction.

The access road program is summarized as follows: One hundred and twenty projects aggregating 240 mi. in length have been completed at a cost of \$12,500,000. Four hundred and eighty-four projects totaling 2,320 mi. are under construction or contracts have been awarded at a cost of \$113,100,000. Four hundred additional projects totaling 1,690 mi. and estimated to cost \$6,900,000 have been approved but not yet awarded to contract.

★ ★ ★

Tar Concrete

(Continued from page 63)

of buildings and utilities had advanced to the proper stage. Three months had passed before intensive construction of permanent roads could begin, and pavement could be laid only during the remaining three months of September, October and November. Despite unfavorable weather, the contractors com-

(Continued on page 82)

FLEXIBILITY

...to apply itself on every job set-up.
...to propel forward or reverse instantly at the touch of a hand lever
...to steer in any or both lanes
...to hoist and swing, while propelling and steering
...to connect and disconnect in one operation
...to help save a profit on close margin jobs



Byers full circle shovels and cranes will Hoist, while they Swing, while they Travel, while they Steer. Do you realize what this means on your jobs?

For instance, a dragline digs a section of ditch in a few minutes. Then it moves back to the next cut. If it's a Byers, it moves back while the operator is swinging to dump the last bucket load. Time saved, money saved, many times a day!

Or, maybe you've heard an operator cuss when he needed to swing a long boom to one side while steering in the opposite direction. He can do this easily, quickly with a Byers because it can swing freely while travelling.

This is another reason why you should investigate Byers 3/4 to 3/4 yd. excavators.

Modern CRANES and SHOVELS

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CMC PUMPS
DUAL PRIME CENTRIFUGAL

FASTER, SURER PRIMING SPEEDS UP WORK!

On the job performance proves that DOUBLE PRIMING, exclusive with CMC speeds priming as much as six times. Yes, any CMC delivers full capacity far quicker than single priming pumps. Renewable Impellers and wear plates add years to their life. Sizes 1 1/2" to 10" ... a complete line.

New Special CMC Pump Catalog Now Ready. Write for your copy!

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MIXERS • PUMPS • HOISTS
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SAWS • CARTS • BARROWS

— BUILDING
Nests
 FOR OUR
 WAR EAGLES



MILITARY airports, — nests for Uncle Sam's war birds, — are today built faster and better even under adverse conditions — than was dreamed possible a short time ago. The great advances made in methods, engineering and equipment are responsible.

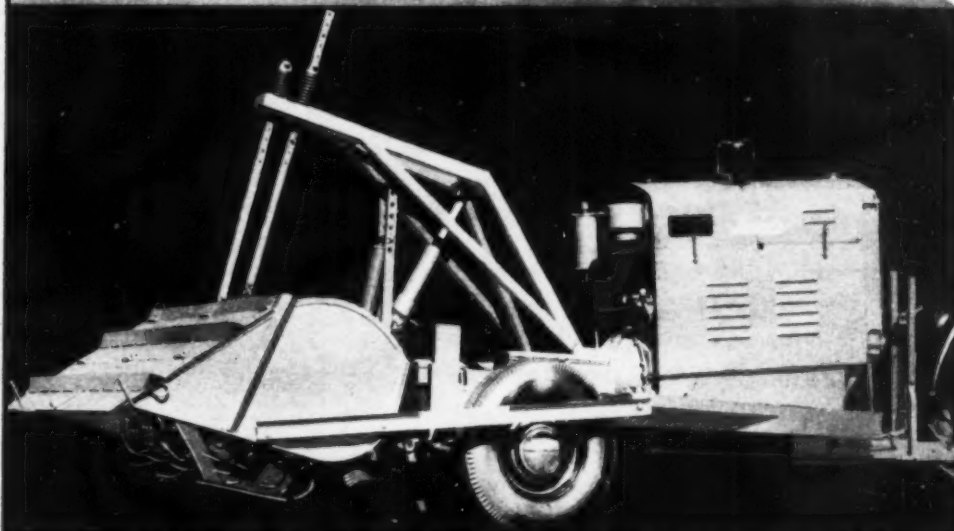
Use of the SEAMAN PULVI-MIXER is a striking example of modern methods — an example Uncle Sam was quick to use in our country's extensive war program covering world-wide airport and road construction.

Whatever the job calls for — soil-cement, bitumen, calcium chloride, or any stabilization process with or without binder, — in place mixing operations are handled with a Seaman more quickly and more thoroughly.

With the very thorough mixing obtained with the SEAMAN PULVI-MIXER, roads and airports cost less to construct, stand up longer and require less maintenance. Recognized engineering authorities now realize this fact.

Contractors! Take a tip from Uncle Sam. Investigate the SEAMAN PULVI-MIXER now!

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RED EDGE



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and Peace

Ever since the days of Bunker Hill, when Ames Shovels played an important part in that famous battle, the Ames line of shovels have contributed their part toward winning wars.

Today, in Africa, New Guinea, Guadalcanal, Russia, Alaska and the hundreds of training camps in the United States, Ames shovels have again become tools of war.

The famous brands comprising the Ames line, each a leader in its field, are as popular with armed forces as with civilians in times of peace. If it's an Ames brand, you can depend upon it for quality and serviceability . . . in War or in Peace.



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HOES • RAKES • POST HOLE DIGGERS

O. AMES



OPTIMUS



PEERLESS



FAVORITE



TWO STAR



HUSKY



PONY



COLT



(Continued from page 80)

pleted practically all road excavation and base and placed about 60 percent of the tar-concrete pavement before storms and freezing temperatures forced the plant to shut down.

Natural soil at the site is a tough, gummy clay which makes an unsatisfactory and unstable subgrade for pavement. To provide a good foundation on this poor material, the architect-engineers for the project (a combination made up of Shreve, Lamb & Harmon, Gilmore D. Clarke & Michael Papuano and Malcolm Pirnie) called for an 8-in. sub-base of stabilized gravel under all pavement. In the roads, the gravel sub-base extends 1 ft. beyond the edge of the pavement. Stone-filled subdrains, extending from the sub-base out to the side slopes of the ditches, provide for drainage of the stabilized gravel.

Not all the tar-concrete pavement is on roads. More than 60,000 sq.yd. of the two-course tar-concrete construction is placed on stabilized gravel base in assembly areas bordering the six drill fields of the station. Similar construction with tar concrete resting directly on 8-in. stabilized gravel base is used on single-lane secondary roads paved 11 ft. wide. Many paths at the station are paved with a 1½-in. surface course of tar concrete on 6-in. stabilized gravel base. Where tar concrete is laid directly on gravel base, a tar seal coat is applied and allowed to soak into the gravel before the topping is placed.

More than half of the total tonnage of tar concrete was laid on the main two-lane roads paved 22 ft. wide. These roads have a tar-penetrated stone base 3 in. thick and 22 ft. wide on top of an 8-in. stabilized gravel base 24 ft. wide. On the stone base, the contractors laid two courses of tar concrete, a 1½-in. binder course and a 1-in. wearing course. This two-course construction to 2½-in. total depth was typical of all tar-concrete paving on roads and assembly areas. The roads were built with a roof crown pitched both ways from the center line; on the 22-ft. pavement, the crown is 3 in.

Stabilized gravel shoulders 6 in. deep flank all roads at the station. Along the 22-ft. pavement, the shoulders were constructed in two widths, 9 ft. or 5 ft., providing overall roadway widths of 40 ft. or 32 ft. Ditches beside these roads were cut to minimum depths of 3 ft. In general, the ditches exceed this depth.

Grading for Roads

Fifteen tractor-scrappers with daily earthmoving capacities averaging 600-700 yd. per unit were used as needed to cut the ditches and build the grade for roads. These machines and the patrol graders that followed them finished the grade so cleanly that practically no hand finishing was required except for minor work in ditches. The full width of the roadway between ditch slopes was cut 5½ in. below final grade to

(Continued on page 84)

FOR BIGGER PAY-LOAD DIGGING

HAISS HI-POWER

**LOWER SHEAVES
HIGH ABOVE
COUNTERWEIGHT!**

Up out of the muck. Non-pocketed.
No place for dirt to jam, to cause
friction or rope wear . . . in
one test, 40% better efficiency
than next best bucket.



Buckets in stock at New York, Philadelphia, Baltimore,
Atlanta, Richmond, Charlotte and Los Angeles . . . Write
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MANPOWER

AT A PREMIUM



THAT vital need of the hour—Manpower!

As precious as time itself—and as irreplaceable; For years Michigan Cranes and Shovels have featured Manpower Conservation through the use of easy, fingertip Air Controls, quick-change attachments, simple, trouble-free mechanisms and "truck mobility" with minimum time "between

jobs"—more productive time on the job.

And now in the vast construction-for-Victory program, these Michigan advantages are potent factors in helping to solve America's pressing problem of MANPOWER.

Full facts on "Michigans" will be mailed promptly. Request Michigan Shovel-Crane Bulletin CM13.

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WHEEL-TRACTOR CRANES

Ask the Men Who Handle 'Em!



"We're pals — me and my Mercer Crane! Just show us the work...we'll clean it up in jig time. My No. 7's a real sweetheart — it's just about the smoothest tonnage tackler on wheels!"



Live Boom, telescoping boomhead, boom head with boom rollers.



Standard live boom equipped with double sheaves for steady and lugging hoist line.



A single hoisting line that goes over the top—designed especially for Suredown.



"Mercer—that's MY Crane! It picks 'em up and puts 'em down just like it was no effort at all! You'll go a long way, Buddy, before you'll find a Mercer Crane that can't take it!"

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Compact, fast, sturdy...they deliver hard, continuous service at low cost. Gasoline-powered...one-man operation. Single or double-drum hoists. Cushion rubber or pneumatic tires. Special booms and heads for every type of lifting, carrying and loading. Parts standardization means simple adjustment and servicing in the field. Our new Catalog No. 65 completely illustrates and describes the entire line. Write for your copy today.



To assist Mercer Crane Operators and help conserve equipment, we offer a group of "Maximum Load Finders" covering all models. These jumper-pocket size "rules", shown at the left, tell the operator at a glance exactly the maximum load he can safely carry at various distances in front of the bumper plate. These handy gadgets are yours for the asking!

MERCER ENGINEERING WORKS, INC.

Materials Handling Equipment

30 CHURCH STREET, NEW YORK, N. Y.

WORKS: Clifton (Allwood), N. J.



"THE NAME THAT CARRIES WEIGHT"

(Continued from page 82)

allow for the thickness of the pavement and stabilized gravel shoulders.

In this earth grade, the tractor-scrappers then cut a box trench 8 in. deep for placement of stabilized gravel sub-base. To drain the box trench, bleeder trenches 2 ft. wide were opened through the earth shoulders to the ditches at 75-ft. intervals on each side and were filled with crushed stone. Equipment employed for these operations on an ordinary day, when the crews handled average quantities of grading and stabilized gravel, included nine tractor-scrappers, two bulldozers, eleven motor graders and seven rollers. As shown by the job records, the working force on such a day totaled about 185 men, including foremen.

Stabilized gravel was placed and compacted in roads at an average rate of 2,500 cu.yd. per day to keep sub-base construction well ahead of paving. Including the stabilized gravel used on shoulders and for fill in drainage trenches, the job consumed up to 4,000 or 4,500 yd. in a day. The material came from pits 22 mi. distant where a clay-sand-gravel mixture was obtained by expert filling of shovel buckets loading trucks.

To speed the paving work, the prime contractors called in firms with plant and personnel capable of handling stone macadam base, tar penetration and tar concrete. Competitive bids were taken for each of these items, and the three jobs were awarded to two companies. On the basis of an agreement made later between the two firms, one of them, A. L. Blades & Sons, took care of all operations on pavement, while the other, the Dale Engineering Co., produced the tar concrete.

Stone base of 1- to 2 1/4-in. stone was compacted to 3-in. depth with 10-ton rollers before being shot with hot tar, RT-11 or RT-12 (depending upon temperature conditions), by pressure distributor at a rate of 1 1/4 gal. per sq.yd. The surface then was filled with 1/4- to 1/2-in. stone which was rolled and broom-dragged until the stone course was well chinked. On the filled surface, another application of RT-11 or RT-12 was made by pressure distributor, 1/2 gal. to the sq.yd., followed by broom-dragging.

Tar Concrete

Tar concrete was mixed, laid and rolled in accordance with New York state highway specifications for hot-laid, two-course construction, Type 6. Specified limits for aggregate gradation on the Sampson job are given in an accompanying table. Limestone coarse aggregate and screenings (stone, sand or limestone) were shipped in by rail. Sand was trucked in from a pit 22 mi. away.

Top mixture was proportioned to provide a dense, impervious surface without sacrificing non-skid qualities. The

(Continued on page 86)

One of 4 Heil 16-yd. scrapers on 200-acre airport project in the Southeast. Over half a million yards of dirt to be moved—fast!

*Here's why HEIL CABLE SCRAPERS
Bite Deep
in hard packed soil*

**..and pick up these
heaping bonus loads easier, faster**

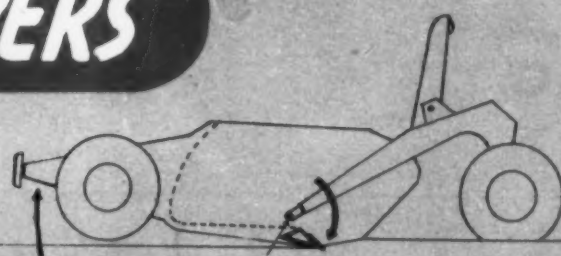
Heil owners know what it means to save the time, expense, and trouble of scarifying hard, compact earth. They get real soil penetration and fast loading under tough conditions — tougher than you may believe possible, unless you have seen the latest Heil machines at work . . . This is just one example of the many features developed by Heil engineers to give you faster, more efficient performance under widely varying field conditions — and easier maintenance, longer life, simpler

field repairs far from supply bases . . . Heil design gives you all-welded construction, fulcrum-type lift, ample tire clearance — feature after feature that add up to performance that helps you build a reputation as a successful operator . . . Use Heil dirt-moving equipment for faster, easier operation; bigger "bonus loads," and long life performance. . . . Write for bulletins giving details of Heil's advanced design.

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GENERAL OFFICES: MILWAUKEE, WISCONSIN

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UNCLE SAM'S CALL**

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Arsenal of Democracy
supply materials for
Victory!



**Draft pivot throws scraper
weight on cutting bit . . .**

The draft pivot point on the side of the bowl is above and behind the blade. A pull on the draft hitch therefore causes the bowl to tip up (see arrow at rear). The weight of the scraper then thrusts the blade deep down into the cut.

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THAT ARE DURABLE

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LUFKIN

SAGINAW, MICHIGAN • New York City
TAPES • RULES • PRECISION TOOLS

(Continued from page 84)

tar ordinarily used was RT-12, but RT-11 was substituted when the weather became colder, as indicated by the cold-weather binder mixture in the accompanying table. This denser binder mix was used where it was impossible, because of construction scheduling, to cover the binder-course immediately with top course. The denser mix withstood construction traffic better than the more open mix. Although good practice requires that binder be covered immediately with top, the contractors in a few places left binder course uncov-

Hot-Laid Tar Concrete Two-Course Construction Specified Aggregate Gradations

SCREEN OR SIEVE	PERCENT PASSING	
	Binder Course	Top Course
1 1/2-in.	100	.....
1-in.	70-100	.....
3/4-in.	20-60	100
3/8-in.	.....	85-100
No. 4	5-20	55-80
No. 8	0-5	35-65
No. 40	.....	14-34
No. 100	.....	6-20
No. 200	.....	5-15

Mixing Formulas

SCREEN		PERCENT	
Passing	Retained On	Binder	Top
2-in.	1/2-in.	60	—
1 1/2-in.	3/8-in.	15	14
3/4-in.	1/4-in.	16	37
3/8-in.	.....	6	42
Tar Cement, RT-12		3	7

DENSE, COLD-WEATHER BINDER COURSE SUBJECTED TO TRAFFIC USE

Passing	Retained On	Percent
2-in.	3/8-in.	39
3/4-in.	3/8-in.	24
3/8-in.	1/4-in.	28
1/4-in.	.....	6
Tar cement, RT-11		3 1/4

ered for periods up to 3 days or more in order to keep traffic flowing or to avoid change-over from binder to top at the plant during the middle of the day.

Tar-concrete binder mixture and top mixture were turned out by a Hetherington & Berner plant equipped with a 5,000-lb. mixer. Paving work was on a basis of 10 hr. a day, 7 days a week, until about one-third of the pavement had been completed; the day then was lengthened to 12 hr. In the longer days the plant produced up to 1,300 tons of the two classes of tar concrete.

Four Adnun black-top paving machines spread and finished the tar concrete courses. Dump trucks fed the hot material into the hoppers of the finishers, which pushed the trucks ahead of them as the loads were gradually discharged while the machines continued to move forward laying pavement.

In addition to the black-top pavers, the paving outfit on an ordinary day used eight rollers, 21 trucks, one motor grader, one bulldozer, one power broom, one gang broom and one tractor. Includ-

(Continued on page 90)

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FOR SALE RENT

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illustrated catalog

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mation on Wellpoint Systems for
dewatering, emergency and per-
manent water supply systems,
also information on pressure
pumps and data for jetting.

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TO PANAMA ..



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Busting Rocks...

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DRIVEN by a 14 ton shaft! Dropped 9 feet four times a minute! You couldn't think of more severe service than that to which these rock buster points are subjected! Yet they are standing the gaff. Because of their Coast Metals hard-facing, they possess exceptional resistance to impact, shock and wear. And give several times the life of ordinary points!

Coast Metals hard-facing is equally applicable to new parts or old ones, of any ferrous metal, including manganese steel, cast iron and chilled iron. Easy to apply, —by the electric welding arc or oxy-acetylene torch. Let our engineers show

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You can't beat a LOWELL WRENCH where speed and strength are required.

For seven decades — seventy years — Lowell Red Ratchet Wrenches have survived the test of actual performance. Their strength and efficiency are established. They enjoy the confidence of the men who use them. They are worthy, to participate in the biggest job in American history — the job of out-producing and out-fighting our enemies.

Have patience with your dealer if he is unable to furnish all of the numerous types and sizes of LOWELL WRENCHES, for we are engaged, for the duration, in supplying the needs of the Nation's Armed Forces.

See how each pawl, when engaged, transmits leverage from the solid stock of the handle, direct to the gear, in a straight line and with a square contact. The pawl is in COMPRESSION ONLY — no shear, no tension, no torsion. The shipper carries NONE of the load. This strong construction insures steady service.



LOWELL WRENCH CO.

1869

WORCESTER, MASS., U. S. A.

1942

(Continued from page 86)

ing truck drivers, the working force amounted to about 20 men at the mixing plant and about 90 on the pavement, for both stone penetration base and tar concrete.

Direction

Construction of the Sampson Naval Training Station is under the immediate supervision of Capt. J. C. Gebhard (CEC) USN, officer in charge of construction for the Bureau of Yards & Docks of the Navy Department. The associated contractors for the \$47,000,000 project are the John A. Johnson Contracting Corp., Brooklyn, N. Y. and the Mt. Vernon Contracting Corp., Mt. Vernon, N. Y. For the contractors, John A. Johnson is project executive manager, Adam J. Petrillo is site executive manager, and C. G. Countiss is project manager. Roads and paving are among the responsibilities of Jacob Feld, site project manager. Assisting him in directing field work on these facilities are Howard Bailey, superintendent of road construction, and Richard Halton, paving superintendent.

★ ★ ★

Alcan Highway

(Continued from page 69)

contractors. As a result of the combined effort the pioneer road was improved, graded and graveled to standards sufficient for truck traffic. Some of the contractors and troops will remain on the project all winter constantly to improve the road and to eliminate the worst stretches.

Because the pioneer route is well located, considering the speed with which the work was done, much more of its length than at first thought possible can be salvaged for the main route. In fact, most of the main road will probably be built simply by further improvement of the pioneer road.

Naturally, in building 1,800 mi. of road every type of ground and topographical condition was encountered. There was a considerable amount of swampy ground to cross, but the bugaboo of impassable muskeg proved to be a myth. The muskeg, a Canadian name for extremely swampy ground, existed, but the army locaters managed to divert the road around the worst muskeg areas to the extent that actually less than 15 mi. of muskeg is crossed in the 1,800 mi. of highway. Where swamp crossings were unavoidable, a corduroy base of poles or logs was put in or, in some cases, it was possible to blade out the soft material and replace it with dry fill.

In the western Yukon Territory perpetually frozen ground was encountered, where the permanent frost line is only

(Continued on page 92)

Takes to Muskeg like



Too bad they didn't have Baker Hydraulic Bulldozers during the Klondike Gold Rush. The way they performed on the Alaska-Canada Highway, and Airbase and Supply Depot construction up there, you would think they were first cousins to a Malemute sled dog. Bakers are tireless workers.

They helped to carve roads through spongy muskeg swamps—like eating soup with a fork—but they did it. They bowled over enough trees to keep a hundred pulp mills busy; made cuts in tough shale and heavy gravel; spread, graded and leveled; pushed mired dirt-buggies; rolled logs for bridges, and what-not. Bakers are versatile.

When the freeze set in, Baker's di-

a Musk-Ox



rect hydraulic down pressure—which puts the full weight of the tractor front end on the blade—was just what was needed to get the finishing touches done.

Bakers keep delivering, even in the frigid zone—use plain fuel oil in the hydraulic system. Ask Comrade Ivan! Bakers took to the Russian tundra like a Siberian musk-ox. On every front, Bakers are bringing hydraulic pressure to bear on the enemy!

May we send a copy of "Unsung Heroes of War"?



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Because these compressors are 100% water-cooled (not half-and-half) their performance is unaffected by outside temperatures — no sticking no overheating, and correct lubrication at all times. Schramm's straight-lined design saves much critical material and, without sacrificing either power or stamina, they weigh as much as 40% less than others of equal capacity.

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SCHRAMM

THE COMPRESSOR PEOPLE
INCORPORATED
WEST CHESTER, PENNA.

(Continued from page 90)

6 to 15 in. below the surface. At first the roadbuilders followed the usual procedure of stripping the top mat of vegetation and trying to grade up the soil beneath. As the mat was removed, however, the ground began to thaw, and blading off the resulting mud only started more ground thawing, until finally a deep morass was created. Then the tactics were changed. Instead of removing the top mat, it was left undisturbed, and in addition all the trees and brush cleared from the right-of-way were spread over the road base. Earth fill was placed on top of this timber and brush insulating mat, further protecting the frozen ground. The hard, unyielding base makes an excellent road foundation. Sometimes it was difficult to find unfrozen material for the fill, but usually a streambed or a high ex-



OLD STAGE-COACH ROAD HOUSE at Gulkana, Alaska, serves as headquarters for Lytle & Green, managing contractors for Alaska section of road. Contractors boast of luxury of a bathroom in this structure.

posed cut bank produced sufficient gravel for the purpose.

All streams have been bridged by pile trestles, some of which are temporary, but most of them will serve for a long time. Ice going out in the larger streams next spring will undoubtedly carry out some of the trestles. A permanent bridge of the suspension type is now being built across the Peace River, the largest of all streams crossed, and timber truss permanent bridges are being built at two more crossings. Several additional streams will require permanent bridges, but these structures will not be built this winter. Piles, bridge timber and hardware and pile-drivers have been spotted at bridges across the larger streams to facilitate replacement in case they should be washed out.

The seven Engineer regiments attacked the road at six different points. The critical stretch of road, insofar as construction was concerned, was that between Fort Nelson and Watson Lake. Therefore, to get troops into this section they were moved over a winter trail across frozen muskeg between Dawson Creek and Fort Nelson last March before the trail became impassable under spring thaws. This maneuver was accomplished with some difficulty, as the temperature was 35 deg. below zero and it was necessary to walk tractors, power shovels and graders 325 mi. under their

(Continued on page 94)

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construction demands
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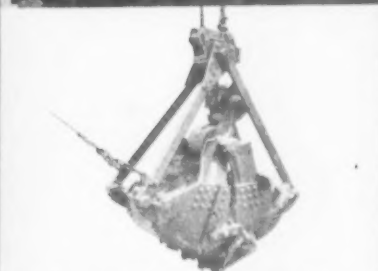
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Meanwhile, thousands of standard Rogers Trailers are serving efficiently on our factory fronts or in transporting defense equipment to various fortifications.

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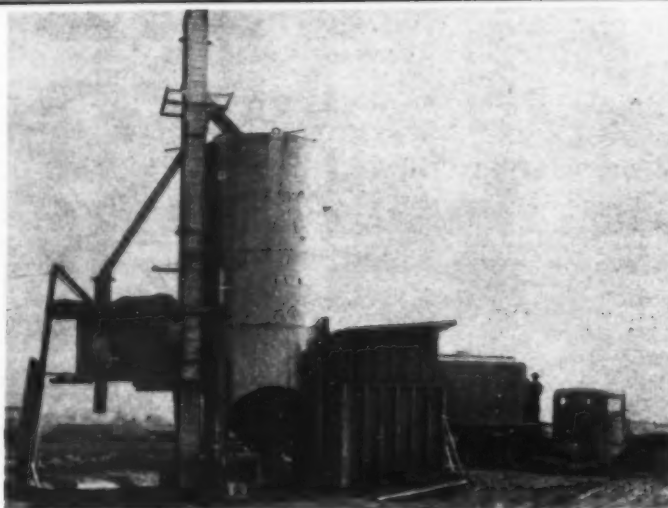
AIRPORTS TODAY —

*Highways
Tomorrow*

The war comes first today with all of us. Vital airports must come before highways. But necessary materials will not al-

ways be on the critical list—gasoline will not always be rationed. America's greatest highway development is on its way.

When post-war highway expansion gets under way, you will find Butler bins, batchers, and bulk cement plants again playing their



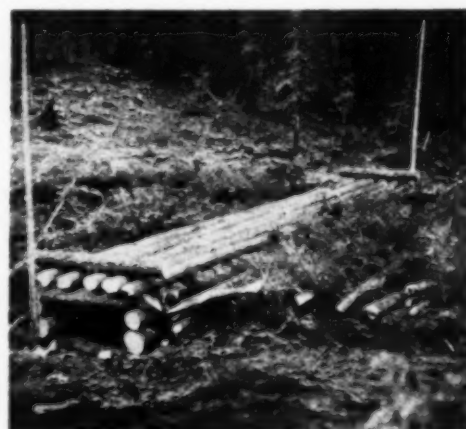
part in the program. Today these plants are building airports—like the portable bulk cement plant above, which stores 500 bbls. of cement and ships in only four quickly assembled pieces. In war as in peace, look to Butler for leadership; the best is less expensive in the end.

BUTLER BIN COMPANY • WAUKESHA WISCONSIN

(Continued from page 92)

own power. Nevertheless, this difficult mission was successfully accomplished and as a result the regiment was able to build the section between Fort Nelson and Watson Lake while other troops worked on the gap between Fort St. John and Fort Nelson. Another regiment marched overland from Carcross, in the Yukon, 100 mi. or so to start at an interior point and thus speed up construction. This move, however, was made in June under much less rigorous working conditions than the sub-zero hike. Another regiment followed behind this one, while still another unit started west from Whitehorse. The seventh outfit went to Gulkana and worked eastward into the Yukon. The final gap in the pioneer road was closed on Oct. 25 in the Yukon, 20 mi. east of the Alaska border.

Each regiment brought along its regulation construction equipment, consisting of tractors, shovels, graders, trucks, portable lighting plants and compressors, all of which was augmented by additional shovels, trucks, tractors, and scrapers. Practically all of the army equipment was new, a fortunate circumstance considering the difficulties in getting repair parts and the lack of repair facilities.




THIS POLE CULVERT is typical of some 5,000 small drainage structures built along highway. In this frozen-ground section, trees are placed across roadway to insulate base prior to placing earth fill.

Road building involved this sequence of operations: Following the line blazed by Engineer officers from aerial photographs, one tractor, equipped with a bulldozer, smashed through the centerline. Trees were easy to uproot, for in the frozen northland they have no tap roots. Just behind the lead bulldozer came two more bulldozers swamping out the full width of clearing. Behind these were four more bulldozers pushing the trees and brush to one side, filling in low spots and preparing the right-of-way for pioneer road construction.

Behind the head units came more troops with tractors and scrapers, filling in and grading up just enough to build a road that would carry supply trucks. Each regimental commander had his own ideas about the standards to which

(Continued on page 96)



Keeping a Time Honored Tradition Alive *and Making the New Year a Living Issue*

Again, the time is at hand, when that wholesome American custom, of extending Greetings and New Year's Wishes, is observed by men of all stations and walks of life. It is a time of goodwill that springs from a spirit, grateful for the things we have and enjoy as a liberty loving people. And, it is a time of inventory and resolve—when the worn page of the past year is reviewed, turned and a new one greets us as we make a fresh start.

While endeavoring to look ahead, the year 1943 takes on a new significance. Heartened by what our armed forces are doing, we as a Nation have been spurred to greater action. And many of us, now more than ever, are striving to match the valor and sacrifice of our boys, so that throughout the coming year we can be happy in the thought of jobs well done—jobs that will hasten early victory and preserve that which we cherish and hold dear.

It is in this spirit, coupled with a desire to be of the greatest possible service, that we and all Austin-Western Distributors extend to you and yours our wishes for health and success, here at home as well as abroad.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

Aurora, Illinois, U. S. A.

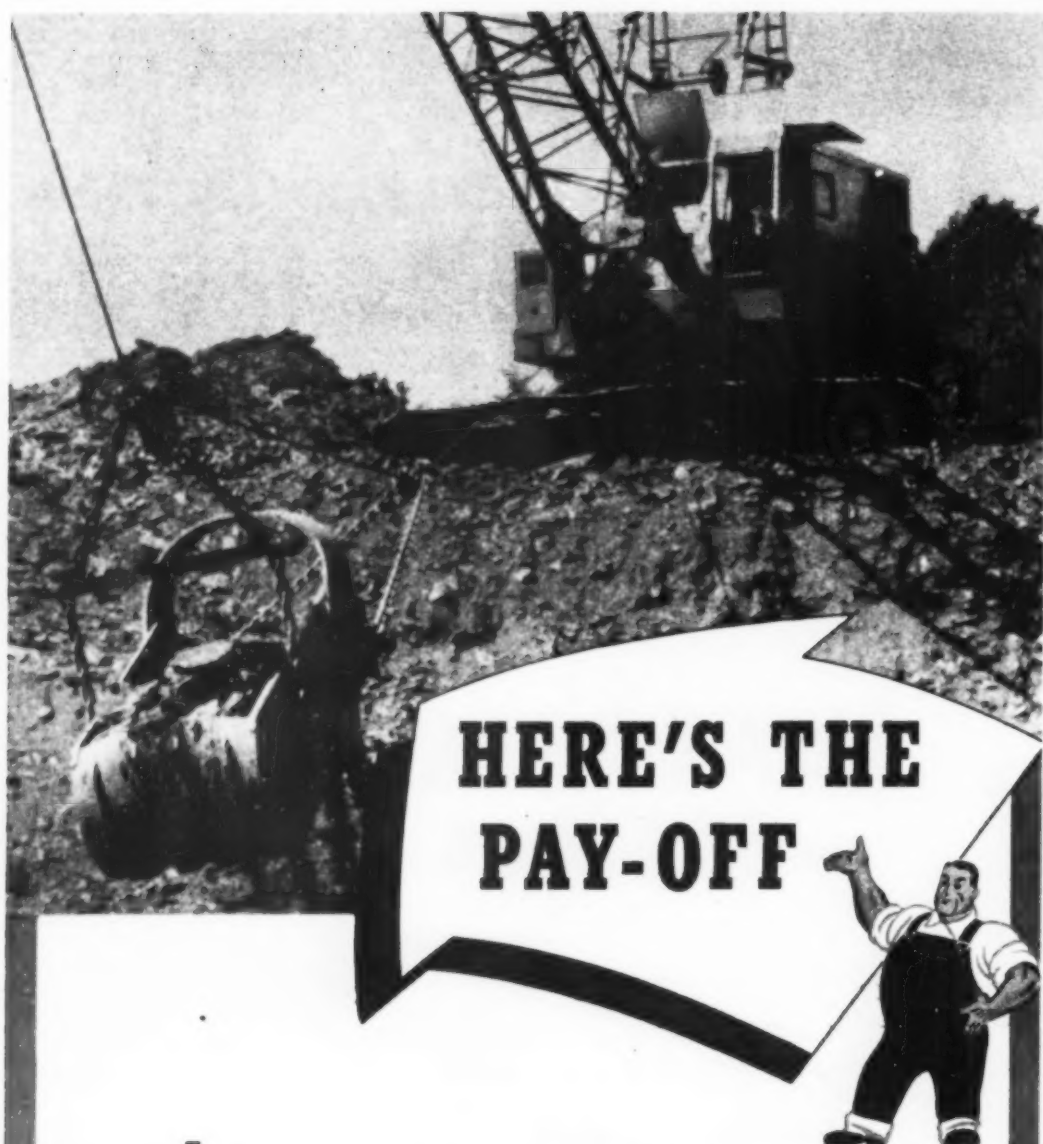
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during the duration, you will find Austin-Western Distributors and their staffs ready and willing to give you all possible help and cooperation. The flag markers on the map indicate nearby service and spare part headquarters throughout the United States.





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Why? Because the PAGE bucket is so shaped and designed that it AUTOMATICALLY lands in digging position every time. ALL its weight is ON THE TEETH causing it to DIG-RIGHT-IN AT ANY DEPTH!

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Automatic
DRAGLINE BUCKETS

PAGE ENGINEERING COMPANY
CHICAGO, ILLINOIS



(Continued from page 94)

the pioneer road was to be built, some building just a rough trail, others doing quite a little grading and even some gravel surfacing. Pole culverts and pole bridges were put in as rapidly as possible. As fast as portable sawmills could be moved ahead, sawed timber was used for bridge construction.

Many of the streams could be crossed by fording, but others, of course, were too deep for traversing by this method. In such cases ponton ferries and bridges were used until pile bridges could be built.

During construction of the Alcan Highway the troops lived in tent camps, which had to be moved every few days. The troops did not operate together in large units, as this procedure would have complicated the moving problem. Instead, they were divided and scattered into companies, platoons and even smaller detachments up and down the road. Each unit, no matter how large or small, was responsible for its own moves. With the constant shifting of troops and the varying condition of the road, the supply problem was a serious one at all times. At its best, camp life was primitive, recreation and entertainment simply didn't exist, and only the will to put the road through at the earliest possible moment kept up the morale of the troops. Army food was of high quality, but became monotonous because, under the conditions, it consisted largely of field rations, with an abundance of canned corned beef, corned beef hash, canned potatoes, canned vegetables and not much fresh meat or vegetables.

The four managing contractors selected by PRA for the Alcan Highway project included R. Melville Smith, Toronto, Canada; Okes Construction Co., St. Paul, Minn.; L. J. Dowell, Seattle, Wash.; and Lytle & Green, of Des Moines, Iowa. In turn they each selected from 9 to 13 contractors from their own section of the country for the actual construction operations, all on a fixed-fee and equipment rental basis. A fifth firm, E. W. Elliott Co., of Seattle, was given a contract for the transportation of all men, supplies and equipment for the contractors from the States.

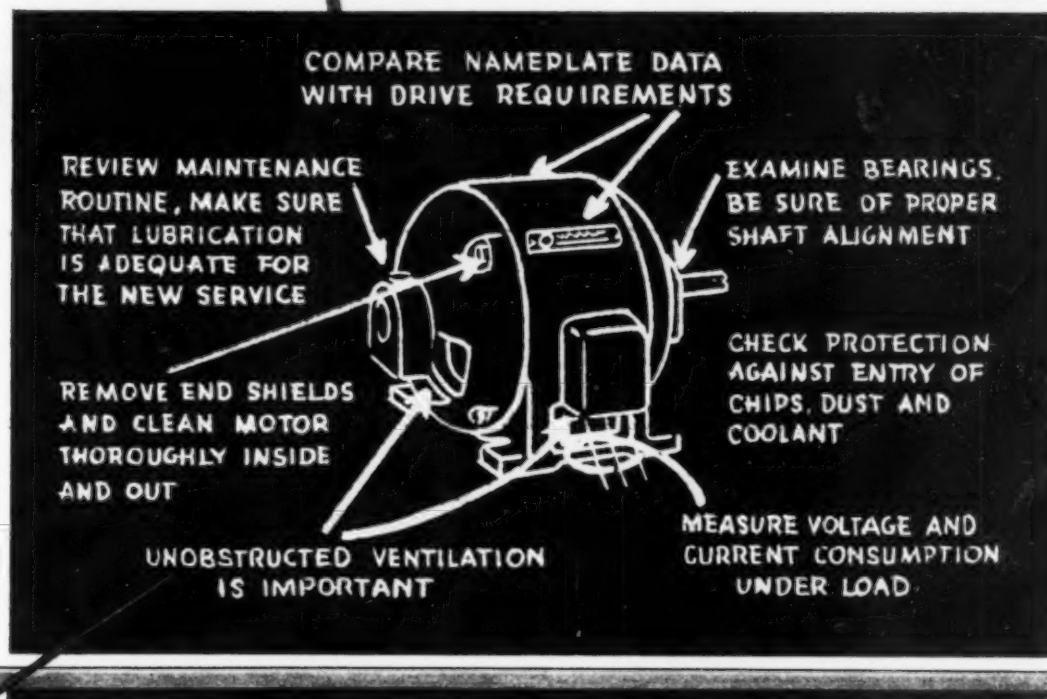
Equipment and Repairs

To the managing contractors and to the individual contractors was given the responsibility of determining what equipment should be shipped to the job. However, the PRA advised that the government would furnish certain equipment and the contractors should take this fact into consideration. What the PRA had in mind was a quantity of CCC and WPA equipment, mostly trucks and tractors. Some of this equipment was old and considerably worn, and although it was all inspected before leaving the United States, many of the units broke down before they had done much work. Equipment repair parts were almost impossible to obtain. In some cases, such as tire requirements,

(Continued on page 98)

IT'S TIME
TO BE A
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MOTOR CARE



protect your production with this maintenance plan

Planned motor maintenance, keyed to today's loads and conditions, saves vital hours by forestalling future breakdowns and delay. In replacing hit-or-miss motor servicing with a regular schedule of trouble-prevention, you'll find real help in the new G-E publication, "How to Care for Motors."

The check list (right) tells what to do. This book tells how to do it, using well-proved methods that save time and help assure long-lasting motor service.

And, of course, your local G-E Motor Representative is always ready to aid you in putting these suggestions into practice, or in getting the new motors you may need for essential wartime projects.



The Navy "E", for Excellence, has been awarded to 92,790 General Electric employees in six plants manufacturing naval equipment.

1 Make sure that motors are selected to *match the job*. Install motors so they are properly aligned with the driven load and are easily accessible for regular inspection.

See "How to Care for Motors"

2 Keep motors free from dust and dirt. Establish a definite cleaning schedule.

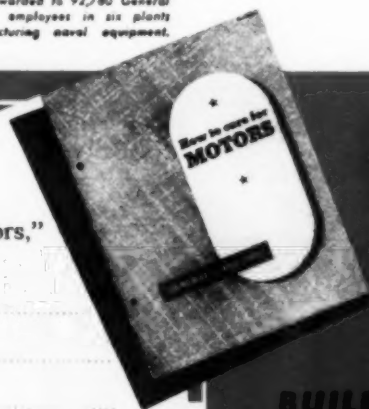
See "How to Care for Motors"

3 Be sure that lubrication is frequent enough to take care of increased production. See that employees are instructed as to proper methods.

See "How to Care for Motors"

4 A general overhauling of hard-worked motors will add years to their life. If your motors haven't had an overhaul in the last year, try to arrange your schedule to permit one.

See "How to Care for Motors"



HOW TO CARE FOR MOTORS

Every supervisor and maintenance man will find this book of value . . . it tells what to do to get the most out of motors, old or new. If you're setting up a maintenance program to keep up with today's unprecedented demands, or if you're "switching" motors from one job to another, or equipping machines with new motors, you'll find this booklet of helpful motor facts will save you time. Write for a copy.

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in the water YOU pump*

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Mud, sand and grit hold no terrors for a Carver pump because:

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If you want more water with less power, longer pump life with less down-time for repairs, you'll be hours and dollars ahead with a CARVER. Write or wire today for complete information on CARVER Centrifugals, available in capacities from 5,000 to 125,000 GPH, gasoline engine, electric motor or belt-driven models.

CARVER PUMP CO., Muscatine, Iowa



(Continued from page 96)

the contractors were informed that certain items would be furnished by the government from central purchase stock, and therefore authority for additional purchases by the contractors was denied. Supplies from government sources did not always materialize, and many a truck, grader and scraper was put on the dead line for lack of tires.

The managing contractors set up substantial repair shops at base headquarters but lack of spare parts handicapped their use. Some of the individual contractors also set up repair shops, largely of a temporary nature, of course, and often in tents or even under a tarpaulin stretched between trees. However, what really kept both army and contractor equipment rolling as well as it did were portable repair shops, welding outfits and portable lubrication units. Much of the repair work and practically all servicing of equipment was done right out in the open on the road. The ingenuity of the mechanics in making repairs out of whatever was on hand was astonishing. A chain-drive sprocket made by welding several plates together and then cutting the teeth out with a torch is one example of the resourcefulness of the mechanics. Difficulties in supplying the various types of greases and oils made it necessary to use whatever lubricants were on hand.

Contractor employees received from 96½ cents to \$2.00 an hour, and most of them worked 77 hours per week without overtime. The men were charged from \$1.50 to \$2 per day for board and room in camps, but were furnished transportation to and from the States. Both the army and the contractors worked night and day, seven days a week.

Winter Maintenance

For maintenance of the road this winter and for operation of the military supply trucks, permanent camps have been established from 45 to 90 mi. apart. The truck drivers shuttle back and forth between camps while the trucks run straight through with relays of drivers. Each camp is equipped with barracks, mess hall, equipment repair and service stations and road maintenance and snow removal equipment. Snow removal is not causing as much concern as outsiders might think, for actually the snowfall in most of the areas through which the road passes is lighter than it is in the northern parts of the United States. At each rest camp will be stationed from one to three snow plows, and in some cases, a rotary plow which will be operated by the road maintenance forces.

Because the territory through which the road passes will be gripped in temperatures from 30 to 60 below zero all winter, not much road improvement nor many changes can be made. However, wherever possible the worst stretches of the road will be improved. The maintenance forces will devote

(Continued on page 100)

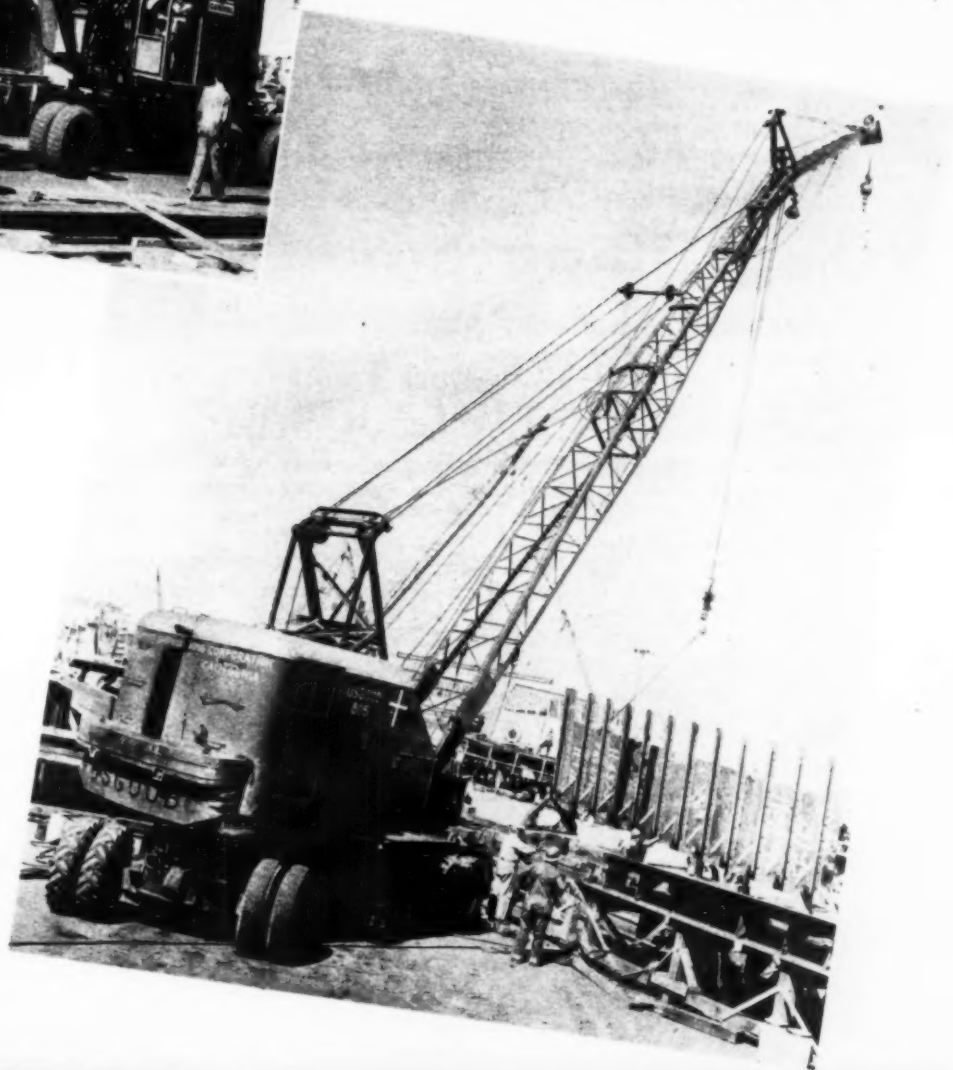


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Give your pump the proper care for long efficient life

FOR all NOVO Model AD Diaphragm Pump owners, we have a new 50-page book on how to care for these pumps, how to get long life and the best service. Give size of your pump, 3" or 4".

These pumps and their power units, are practically taken apart right before your eyes. Any operator can understand the instructions for operation and maintenance regardless of his previous experience.

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How to clean or change pump valves—points of lubrication and wear.
Engine adjustments.....Tappet and bearing adjustments
Valve timing and grinding.....Proper lubrication, etc.

Disassembled (explosion) views are shown from which to order parts. Each assembly illustrated with parts disassembled, but in the proper order. Every nut, stud, and lock washer shown. You can't go wrong even if you don't know the name of the part—just give the reference number on the part and the plate and page number.

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Send for your free copy. Give the size 3" or 4". Factory overhaul of engine here.

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Descriptive literature on Diaphragm pumps..... Self-Priming pumps..... Pressure pumps.....
Information on NOVO Engine Factory Overhaul.....

NAME.....
ADDRESS.....
CITY..... STATE.....

(Continued from page 98)

much of their efforts to keeping the hills sanded and the bridges in good repair.

Personnel

The Alcan Highway is under the jurisdiction of the War Department. Since Sept. 1 it has been a part of the Northwest Service Command, headed by Brig. Gen. James A. O'Connor. The road also comes under the Chief of Engineers, Maj. Gen. Eugene Reybold and Brig. Gen. C. L. Sturdevant, Assistant Chief of Engineers in charge of troops. In the early stages road construction was under the direction of Brig. Gen. William M. Hoge, who left in August for another big assignment. Since then Col. John W. Wheeler has been in charge of the road, assisted by Col. E. G. Paules in charge of the north sector, and Col. R. D. Ingalls in charge of the southern sector.

For the Public Roads Administration, Thomas H. MacDonald is commissioner and J. S. Bright is regional engineer in charge of the highway. Fred Capes is engineer in charge of Fort St. John, Frank E. Andrews is in charge of Whitehorse and C. G. Polk and L. M. Huggins are on the Alaska section.

For the managing contractors the following are in charge: Dowell Construction Co., Seattle, L. J. Dowell and Ross Woodward; Okes Construction Co., St. Paul, Day Okes and William Bates; Lytle & Green, Sioux City and Des Moines, Iowa, O. W. Crowley and C. C. Coykendall; E. W. Elliott Co., Seattle, R. B. Johnson; R. Melville Smith Co., Toronto, T. F. Francis.

★ ★ ★

Virginia Flight Strip

(Continued from page 74)

considerations of being adjacent to a main highway, near a town (to make the flight strip useful to civilian aviation after the war), and so situated as to permit economical construction.

Favorable topography, drainage and soil at the site allowed construction of a flight strip possessing excellent longitudinal and transverse grades with only moderate excavation and almost no pipe, except for two 24-in. cross drains under the strip and two 48-in. culverts under a state highway which had to be relocated for 1 1/4 mi. around the site. One part of this highway, which formerly bisected the area, was preserved as an access road into the flight strip from another state highway 3/4 mi. distant.

From a grading standpoint the selected site was nearly perfect. A theoretical plane 800 ft. wide and 8,000 ft. long laid down with one end 14 ft. higher than the other would have deviated not more than 24 in. from the natural ground surface except for a short space at one end. Consequently, it was neces-

(Continued on page 102)

WARTIME HELP

..to Lengthen Tractor Life...Reduce Upkeep

As America goes "all-out" . . . more and more tractors are needed by our armed forces. This means you have to take better care of your present machines than ever. Every one "kept rolling" means one more for Uncle Sam. To help you make 'em last . . . Allis-Chalmers suggests these wartime helps on tractor care and maintenance.

① TRAIN YOUR OPERATORS . . . All your tractor operators should know how to take care of your tractors. Start your own service school. Call your tractor operators together at the most convenient times and let your head mechanic or seasoned operators instruct them. Or try to arrange with your Allis-Chalmers dealer to send over one of his mechanics to conduct your service school. If it is at all possible, he will be glad to cooperate. Have everyone attend that has even the remotest connection with your tractors. The operator's job will be made easier . . . and it will be easier on your machine and pocketbook! Use this preventive maintenance plan!

② CHECK TRACTORS FREQUENTLY Inspect and overhaul your tractors at frequent intervals. Keep tracks at proper tension, make wear take-up adjustments as necessary, replace worn parts before they can damage the surrounding mechanism, lubricate according to instructions. You'll not only save your machine . . . you will save critical material . . . save plenty of grief, time and money. Call in the skilled help of your Allis-Chalmers dealer for inspections, overhauls, rebuilds, repairs. He will do the work right, at lowest cost and with genuine parts. His knowledge and experience are always at your command!

Start your wartime training and maintenance program now! Regardless of how soundly constructed, a tractor will produce with high efficiency only if it is carefully operated, well lubricated, properly serviced!

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- 3 LIMITATION ORDERS—Interpretation of

latest government limitation orders affecting construction equipment.

- 4 SUBCONTRACT INFORMATION—Frequently dealers possess information on subcontract opportunities.
- 5 REBUILDING FACILITIES—Enlarged, modern

shop facilities to handle rebuilding with speed and efficiency.

- 6 SERVICE EDUCATION—Instructions on how to operate and service equipment correctly. Provides service school instructors.
- 7 REPAIRS AND MAINTENANCE—Quick, efficient repairing by skilled, factory-trained mechanics, using the right tools

and genuine parts.

- 8 USED EQUIPMENT—In some instances, good rebuilt construction equipment may be available.
- 9 RENTALS—A 1 equipment rented at nominal charge.
- 10 EQUIPMENT EXCHANGE—Serves as information center on used equipment available in territory.

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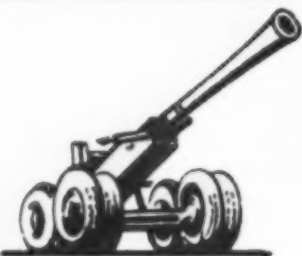
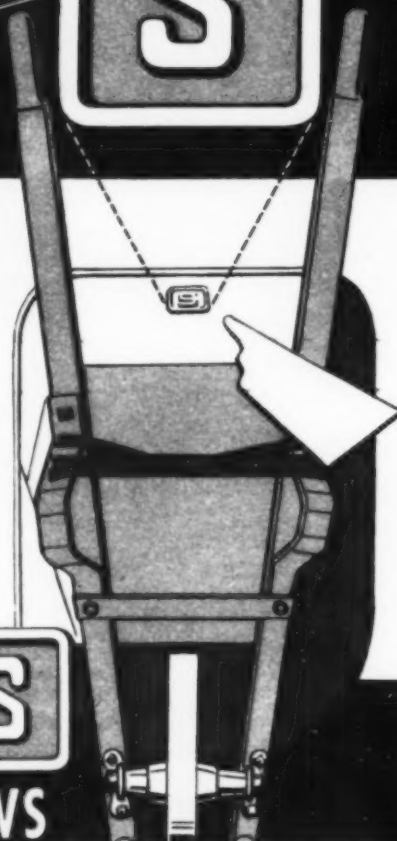


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Jackson VIBRATORS

(Continued from page 100)

sary to excavate only enough earth to obtain the required transverse section and to provide material for blanketing unsuitable natural soil at one end.

By moving 186,000 cu.yd. of earth, the constructors graded an area of the minimum size for a flight strip at sea level, 8,000 ft. long by 500 ft. wide between open side drainage ditches. On this area was placed a paved runway 150 ft. wide and 4,000 ft. long (the minimum length at sea level) with stabilized extensions, each 150 ft. by 1,000 ft., at the two ends. The runway has a continuous longitudinal grade of only 0.19 percent, well under the desirable maximum of 1 percent and the absolute maximum of 1.5 percent specified by the PRA standards for flight strips. Transverse grades, sloping both ways from the center line of the runway, are 0.8 percent for pavement and 1 percent for shoulders.

Soil on the greater part of the site was a sandy type, classified in the A-2 category of the PRA soil groups, containing sufficient binder to be compacted into a stable sub-base for the runway. This soil was utilized over the entire paved area to make the 10-in. compacted foundation for the stabilized base. Toward the upper end of the site the soil deteriorated to an unstable silty type in the A-4 group. Selected sandy soil of the A-2 type was placed to a minimum depth of 2 ft. on top of the silty soil.

Runway Construction

On the 10-in. compacted sub-base for the runway, the contractors placed an 8-in. base of natural clay-sand-gravel hauled in from a pit where the material was mixed in the dipper of a power shovel under the supervision of a state inspector. The compacted, stabilized base was primed with tar. As a wearing surface, sand-asphalt mixture produced by a plant installed at a natural sand pit was spread, struck off and compacted to a depth of about 1 3/4 in. on the base.

Runway extensions 1,000 ft. long were built to 6-in. compacted thickness of the same clay-sand-gravel mixture used for pavement base. The extensions provide for emergency over-runs by large planes in landing and take-off. They are given no bituminous treatment because it is desired that they be plainly distinguishable from the paved runway, as seen from the air.

Tractor-scrappers handled all grading for both the flight strip and the 1 1/4-mi. state highway relocation. One fill, 500 ft. long, crossing a muck deposit on the road relocation, took 54,000 yd. of fill. The contractors operated four Gar Wood 16-yd. scrapers (two cable-controlled and two hydraulic) drawn by Allis-Chalmers HD14 diesel tractors, with a fifth tractor of the same size to act as a pusher in loading the scrapers. Tractors pulling the scrapers were equipped also with pusher plates, partly for use in pushing other scrapers when loading.

(Continued on page 104)

IT TAKES A *Two-Fisted Man*
TO TOPPLE THE TIMBER



... AND A
Two-Fisted Oil
TO HAUL IT!



"WEAK-SISTER" LUBRICANTS don't last long in a logging operation. That's why in the logging camps and sawmills of many of the world's largest lumber companies you'll find a preference for Shell Lubricants—they're tough!

The Weyerhaeuser Timber Company, Potlatch Forest, Inc., The Hammond Lumber Company, and many more, use Shell Diesel and gasoline engine oils, greases, and other lubricants, almost exclusively.

Not only in the lumber industry but in every kind of Diesel operation you'll find Shell Lubricants helping America lengthen the life of the engines and machines that must continue to deliver the goods on time.

Shell has lubricants to fit *your* needs, too. Have the Shell man tell you about them.

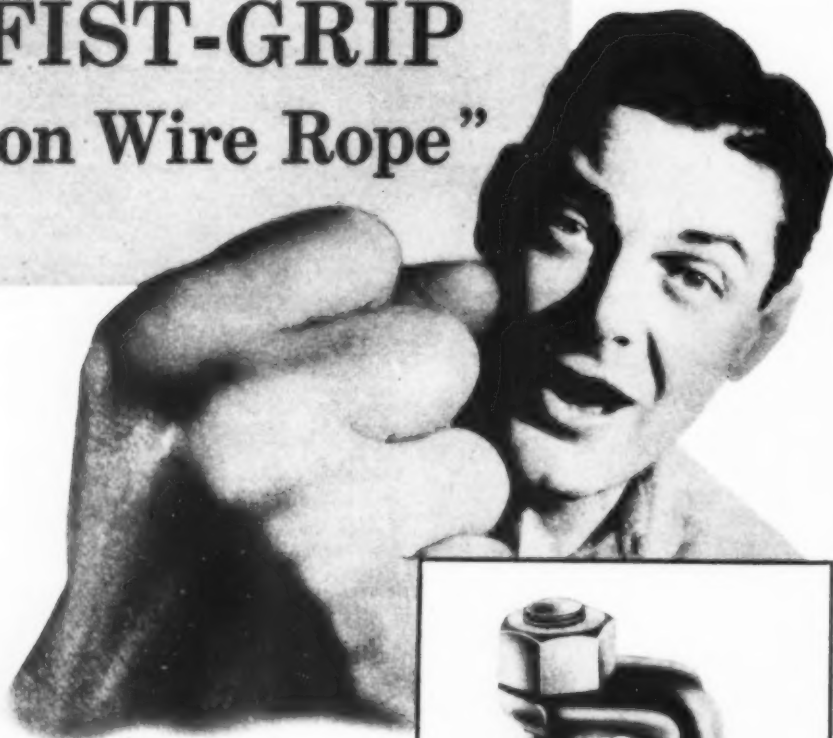
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YOU can save rope, save clips — just as we do — by using Laughlin 'Fist-Grip' Safety Clips, instead of 'finger-pinch' U-bolt clips that crimp and injure wire rope.

"With 'Fist-Grip' Clips the bolts are on opposite sides — the four bearing surfaces grip like a fist, not a 'finger-pinch'. Three 'Fist-Grip' Clips do the work of four U-bolts! Design is so strong that less steel is needed in each clip. 25% less steel in all is saved per assembly.

"I figure the rope, clips and steel saved mean more guns and bullets for our boys."

Competitive Tests Prove Greater Holding Power of Laughlin "Fist-Grip" Clips

With 4 U-bolt clips at 37,750 lbs. load, $\frac{3}{4}$ " rope broke at saddle, while only 3 Laughlin Safety Clips held the same load without rope breakage, because extra bearing surfaces grip without crimping. Here's the clip that fights for your country! Investigate!

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YOU can save manpower and metals with the "FIST-GRIP" CLIP

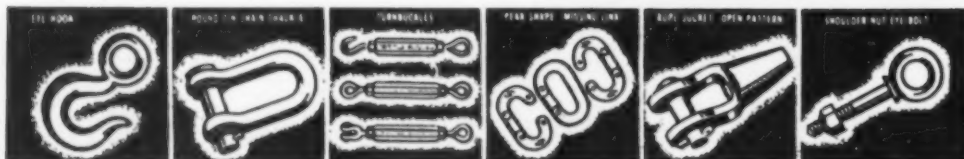
Saves Manpower

greater holding power, less work; can't be put on wrong.

Saves Metals

no special-shaped wrench, fewer clips needed, no spoiled rope, 25% less steel.

**THE THOMAS
LAUGHLIN
Company
PORTLAND, MAINE**



(Continued from page 102)

but more particularly for adding useful weight to the machines, which have high tractive horsepower in relation to their poundage. Sandy fill material spread in layers by the scrapers was further distributed and compacted by two Allis-Chalmers tractors, an HD10 diesel and a WM gasoline, fitted with Gar Wood angledozing blade attachments.

Natural sandy soil possessing adequate binder and a moisture content near the optimum was compacted to 10-in. thickness for sub-base in the runway area by disk harrows and sheepsfoot tamping rollers, drawn by crawler tractors. The disk harrows loosened and mixed the material for compacting by the tamping feet of the sheepsfoot rollers. This procedure obtained nearly 95 percent of theoretical compaction, the compacted soil weighing 115 to 120 lb. per cu.ft.

Material for the stabilized clay-sand-gravel base came from a natural deposit where it was mixed in desired proportions in the shovel dipper by the operator of a Lorain 1-yd. gasoline excavator. The contractors planned to load the stabilized mixture at a rate of 1,200 yd. per 12-hr. day. A fleet of 25 $1\frac{1}{2}$ -yd. trucks was available to haul the material an average distance of 4-mi. to the dumping point on the flight strip. The job required a total of 30,500 yd. of stabilized mixture for all purposes: 8-in. base under paved runway, 6-in. stabilization on runway extensions, and 10-in. stabilized construction for 20-ft. surface on the highway relocation.

Stabilized mixture for runway base and runway extensions was compacted at optimum moisture content to produce a density of 108 to 115 lb. per cu. ft., as required by specifications calling for at least 95 percent of theoretical maximum compaction. The angledozing tractors and a Caterpillar diesel motor patrol with a 12-ft. blade struck off and spread the dumped material, which then was mixed and manipulated by a Seaman rotary tiller powered by a Case wheel tractor. Where necessary, a disk harrow supplemented the tiller. Sheepsfoot tamping rollers compacted the mixture. In the final stages of the process, the patrol grader and a Galion multiple-blade planer pulled by another Case wheel tractor maintained a true surface on the stabilized layer.

Sand-Asphalt Pavement

Runway pavements of flight strips are designed to carry the loads and volume of expected traffic. For this particular flight strip, a $1\frac{3}{4}$ -in thickness of sand asphalt was considered adequate.

The stabilized base was primed with 0.35 gal. per sq.yd. of RT-3 tar applied by pressure distributor and allowed to cure for at least seven days before the sand-asphalt course was laid.

Clean, well-graded sand, having a gradation between $\frac{3}{8}$ in. and No. 80 sieve, was accessible less than 6 mi. from the flight strip at a pit which had

(Continued on page 106)

PAGES LIKE THESE TELL
YOU WHAT, HOW, WHY!

A NEW ERA OPENS WITH

THIS BOOK

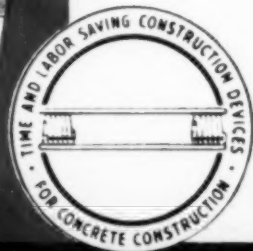


THIS BOOK WILL GIVE YOU ARCHITECTS AND BUILDERS—CONTRACTORS AND ENGINEERS—JOB SUPERINTENDENTS—HELPFUL FACTS ON FORM WORK YOU'VE ALWAYS WANTED.

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Illinois

(Continued from page 104)

served during previous seasons for sand-asphalt paving on highways. This aggregate was mixed with 7 percent of 85-100 penetration asphalt, at a plant set up in the sand pit.

A large revolving mixer of the Sam Finley closed-drum type turned out 5-ton batches of sand-asphalt. Each batch was mixed at about 260 deg. F. for 1½ min. after the asphalt had been sprayed on the aggregate inside the revolving drum. A drum gate had to be opened to charge the aggregate and to discharge the batch. From 2 to 3 min. was required to apply the liquid asphalt, amounting to about 80 gal. per batch, under 65-lb. air pressure.

On the primed, stabilized runway base, a Barber-Greene tamping-leveling finisher laid the sand-asphalt mixture in 10-ft. strips at a rate of 175 lb. per sq.yd. and a temperature not less than 200 deg. F. Behind the tamping-finisher machine, final consolidation of the wearing course to maximum density was accomplished with 10-ton tandem rollers. A total of 6,000 tons of sand-asphalt was mixed and placed at a daily progress of about 350 tons in 10 working hours.

Shoulders 6,000 ft. long by 175 ft. wide from pavement edge to ditch slope were treated to produce a well-sodded grass cover desired for three reasons: to prevent dust nuisance created by the backwash of airplane propellers, to prevent erosion and to aid camouflage. Shoulder treatment started with spreading of selected natural topsoil containing as many grass roots as possible. After final shaping, the topsoiled shoulders were lightly scarified, disked and sown with rye at a rate of 1 bu. per acre. A strip 50 ft. wide adjacent to each edge of the pavement was mulched with hay held down with a sprinkle of topsoil. In the spring, after the rye has attained a height of 10 or 12 in., it will be cut and left as mulch. At that time, Bermuda grass will be sown by broadcasting at a rate of 40 lb. per acre.

Direction

In common with all flight strips constructed under the \$10,000,000 program, the location of the project here described had to meet the requirements and receive the approval of the Army Air Forces. Subject to these limitations, the choice of the site and design of the flight strip were made by PRA in collaboration with the participating state highway department, which then awarded the contract and supervised construction under PRA direction. Thomas H. MacDonald, commissioner of the Public Roads Administration of the Federal Works Agency, designated Fred E. Schnepfe as director of the Flight Strips Division, in charge of carrying out the program. Construction on the project was under the supervision of M. M. Todd, resident engineer for the state highway department.

Contractors for the flight strip were

(Continued on page 108)

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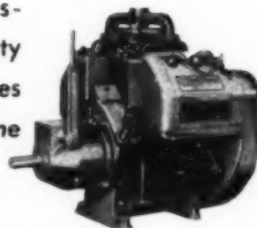


ON THE BOARD
OR ON THE JOB

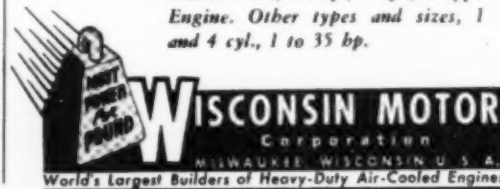
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- One 72" x 25' Tel Smith Hercules Scalping Screen
- One 16-B Tel Smith Primary Breaker
- One 5' x 12' Tel Smith Double Deck Pulsator Screen
- Two 30" x 18" Tel Smith Double Roll Crushers

Sand and Gravel Plant Equipment by TELSMITH

- Two 60" x 22' Tel Smith Hercules Washing Screens
- Two 5' x 12' Tel Smith Double Deck Pulsator Screens
- Two 3' x 8' Tel Smith Single Deck Pulsator Screens
- One 57" x 12' Tel Smith Screw Rewasher
- Four No. 10 Tel Smith Sand Tanks
- Four 66" x 16' Tel Smith Twin Screw Sand Classifiers
- Five 30" x 5'6" Tel Smith Plate Feeders
- Three 24" x 5' Tel Smith Plate Feeders

Total power requirements for both quarry, and sand and gravel plants..... 1250 hp.

● Down in Arkansas, near Mountain Home, the Utah Construction Co. and Morrison-Knudsen Co. are building the huge Norfolk Dam. A flood control project, it is also a future source of power. The expected completion date is July, 1944.

About 1,500,000 cu. yds. of aggregate will be needed. To produce it, this combination quarry and sand-gravel plant was designed by Tel Smith engineers. And all its machinery, except some conveyors and electrical equipment, is Tel Smith-built.

Six 10-yd. trucks haul the limestone rock from quarry to plant. The plant's rock-crushing section turns out 140 cu. yds. per hr. Three sizes of product are made: 6"-3", 3"-1½", and stone dust.

35 bottom-dump cars, each of 140,000 lb. capacity, haul the ma-

terial from the White River gravel bars to the plant. Its sand-gravel section has a capacity of 260 cu. yds. per hr. and makes 4 sizes—3"-1½", 1½"-¾", ¾"-4 mesh, and minus 4 mesh sand.

The plant's combined aggregate capacity is 8000 cu. yds. per 20-hr. day. Exceptionally efficient design, combined with automatic inter-coupled controls, make it possible to operate this large and complete aggregate plant with only about six men. Uninterrupted performance of Tel Smith equipment has made it possible to exceed the planned concreting schedule.

Today's Tel Smith Plants are producing under pressure, to win the war. Tomorrow's Tel Smith Plants will do an even better job for you, at still lower over-all costs. Get Bulletin EP-10. Q-8

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Joseph B. Eastman, director of the Office of Defense Transportation, has taken the stand that highway transportation is absolutely essential to the winning of the war. GMC is co-operating with the ODT to conserve the life and operating efficiency of America's trucks. General Motors Truck dealers have had years of experience in perfecting Preventive Maintenance . . . the best known service procedure for getting the most miles from truck equipment. As a result, GMC's wartime service program, called "Victory Maintenance" is especially well qualified to keep your truck equipment *pulling for Victory* for the duration.

Special "Service Payment Plan" Through Our Own YMAC

THE TRUCK OF VALUE
GMC TRUCKS
 GASOLINE - DIESEL



(Continued from page 106)

Perkins & Barnes, with James E. Courtney as superintendent. The sand-asphalt wearing course was laid by Sam E. Finley, Inc., under the general direction of W. B. Adams, vice-president, with Frank Johnson as plant superintendent.

★ ★ ★

Balanced Earthmoving Outfit

(Continued from page 48)

this production to attain the overall daily average of 20,000 yd. necessary to meet the progress schedule for the grading contract.

Ability to assemble a large mass of equipment quickly and to service it effectively on the job marked the contractor's operations. A Graco service station mounted on a truck gave regular lubrication and tire service to the equipment units operating on each shift.

Earthmoving Equipment

For stripping topsoil (stockpiled and later spread on 160-acres of landing strips and intermediate areas) and for short-haul work not exceeding 1,000 ft. the contractor used five LeTourneau scrapers, four 14-yd. one 10-yd., drawn by Caterpillar 96-hp. diesel tractors. On longer hauls, ranging up to 3,000 ft. or more, trucks loaded by shovels or elevating graders delivered material to the fills. From 40 to 55 trucks equipped with 3-yd. to 10-yd. bodies were required to serve the seven power shovels, of $\frac{3}{4}$ to $1\frac{3}{4}$ -yd. capacity, on the job. The shovel equipment included three Bucyrus-Eries (one $1\frac{3}{4}$ -yd. and two $\frac{3}{4}$ -yd.), three Lorains ($1\frac{1}{2}$ -yd., $1\frac{1}{4}$ -yd. and 1-yd.) and one Lima (1-yd.). During the first 50 days of the 70-day period, most of the long-haul material was loaded by six of the power shovels, supplemented during part of the time by an Austin-Western elevating grader with an engine-driven 48-in. belt on a 28-ft. carrier. The $1\frac{3}{4}$ -yd. shovel, to which extensive repairs had to be made after it had been purchased and shipped to the job, went into action in the final spurt to complete the grading within the contract time limit, as also did a new Caterpillar elevating grader with a 48-in. self-powered belt on a 32-ft. carrier. When these additional units started work, the truck fleet had to be greatly enlarged to take the increased output.

Considerably more than half of the original truck complement was drawn from the contractor's own fleet of 25 units, made up of 23 Sterlings ($4\frac{1}{2}$ - to 10-yd.) and two Macks (8- to 10-yd.). Additional rented trucks comprised

(Continued on page 112)

HAND

SCREEDING FLOATING FINISHING

AREN'T NECESSARY

Whiteman Machines Do 3 Jobs in 2/3 the Time!

Mechanize not just one — but all 3 steps of concrete slab screeding, floating and finishing — your present crews can do 40% more work — get the job done in $\frac{2}{3}$ the time!



These machines, proved on rush jobs around the country, have solved the manpower shortage, permitted even "green hands" to produce stronger, denser concrete than by hand. Time and costs have been cut up to 50%.

Here's the way to let WHITEMAN Machines do the back-breaking work:

1 RODDING — One man operates the power-driven WHITEMAN Rodding Machine. The husky gasoline engine gives a 5-in. transverse movement to the rod sticks (screeds). The operator easily pulls the machine down the screed headers as it simultaneously levels and compacts the mix. Even with low slump mix 4 cu. yd. can be handled in 5 minutes.

2 FLOATING and **3 FINISHING** are done by the same WHITEMAN Finishing Machine. It's only necessary to change the trowels. For floating, use the broad, flat "Heavi-Duti" trowels. One man covers 1,000 sq. ft. in 15 minutes — gets a perfect "float" surface.

When you are ready to finish the slab, put the adjustable "Finish" trowels on your WHITEMAN Finishing Machine. You'll get dense, smooth concrete — and without any hand work!



* If you haven't seen both of these machines at work, saving time and money, write or wire for the name of your nearest WHITEMAN distributor



NEW . . . ADJUSTABLE SCREED STAKE CAPS

These new WHITEMAN stake caps fit over any 2"x2" wood stake — are adjustable, after the stake is driven. Stakes may be cut on the job — short for hard ground, longer for filled ground. The malleable cap is easily removed and reclaimed. Either 2 x 4 wood or 2 1/2" pipe header screeds fit into the caps. Write today for bulletin and sample.

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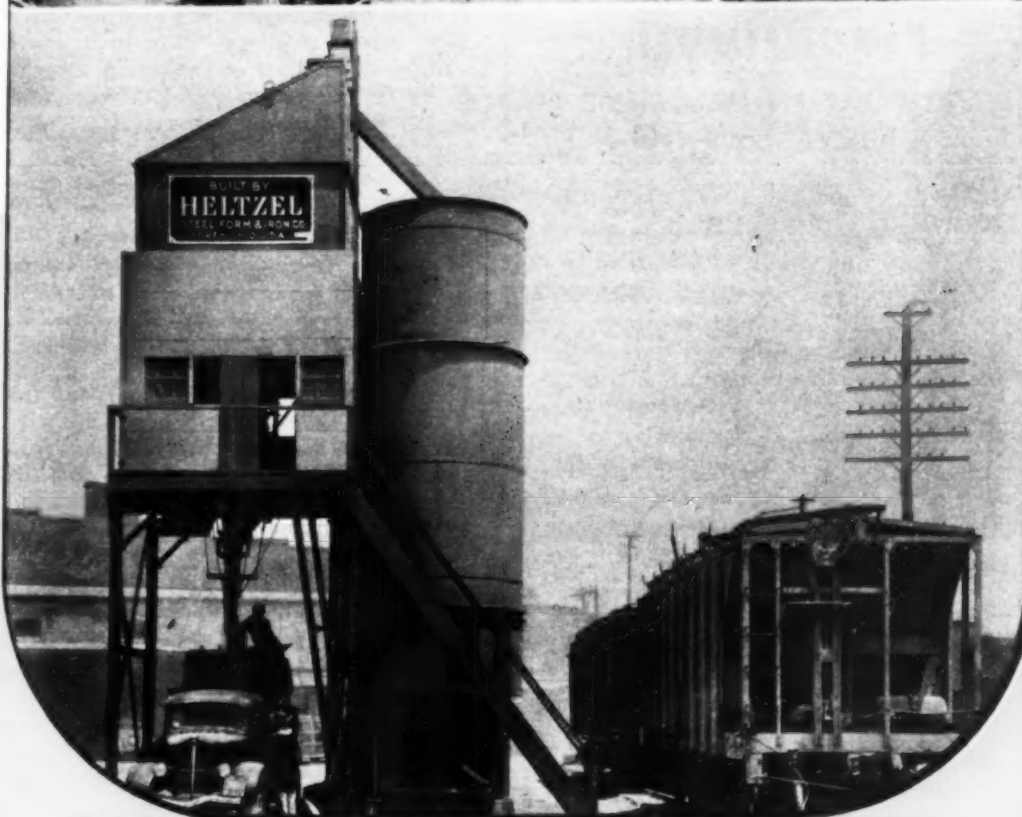
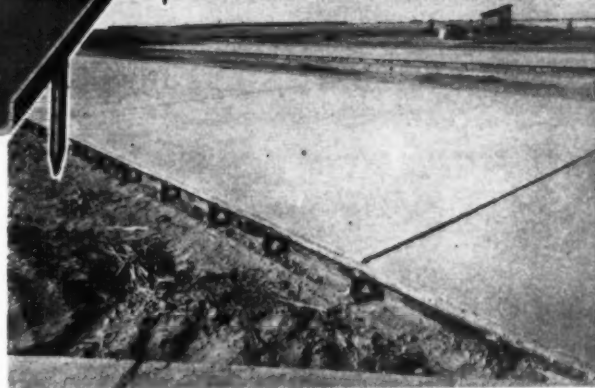
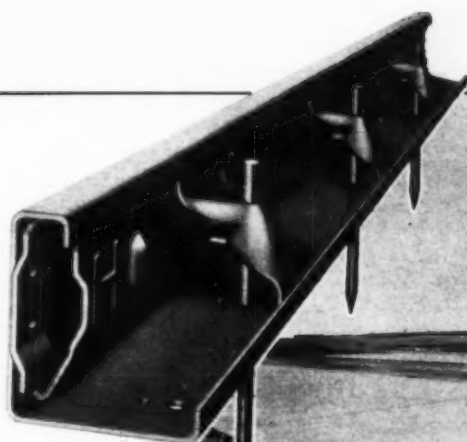
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5 H.P. Gasoline Engine Model

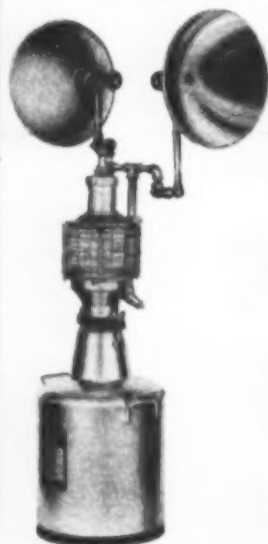
No contractor who has used a MALL Portable Chain Saw to fall trees or square heavy timbers and piling to size would go back to slow, costly hand methods. There is no pushing or pulling. You simply hold bumper against timber, tree, log or piling to be cut, turn on power and the Mall Saw does the rest. Swivel feature permits horizontal, vertical or diagonal cuts, automatic oiler assures a steady flow of lubricant in all positions. A sharpening device puts an edge on the big husky teeth in a few minutes anywhere on the job. Available with 24", 36", and 48" cutting capacities—gasoline engine, air or electrically driven. Full details upon request.

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(Continued from page 108)

Diamond T's, Fords and Internationals, 3- to 5-yd. capacity. For part of the time a Heil 12-yd. hydraulic-control wheel scraper drawn by a Walter pneumatic-tired diesel tractor provided added capacity on long-haul earthmoving. This unit could travel 25 mph. on good haul roads.

In the first 50 days on the job, lack of shovel operators and truck drivers restricted four of the shovels to one 10-hr. shift per day. Only the 1½-yd. shovel and one ¾-yd. shovel were able to operate two 8-hr. shifts. Tractor skidders were more plentiful, and the scrapers worked a double shift of 16 hr. per day. Three skid-mounted floodlight towers, two equipped with 5,000-w. plants and one with a 2,000-w. plant, furnished light after dark. Operating on the reduced schedule necessitated by the operator shortage, the outfit moved 15,000 to 22,000 yd. per day, and completed well over half of the grading contract. With additional equipment and manpower planned for the finish of the job, the contractor expected to outstrip the best previous daily output by more than 50 percent.

Airport Grading

Covering an area nearly 1 mi. square on what was rolling farmland, partly wooded, the airport conforms to Class 4 requirements of the Civil Aeronautics Administration. Under the grading contract, the field was graded for four 500-ft. landing strips, 4,200 to 5,200 ft. long. A separate paving contract, on which work started while grading was still in progress, provided 150-ft. paved runways on two of the landing strips, with auxiliary taxiways paved 50 ft. wide.

Airport grades were planned for economical balancing of cuts and fills. Hill-tops were cut down 8 to 15 ft. and valleys were filled to maximum depths of 24 ft. Maximum grade on the completed landing strips is less than 0.75 percent.

Fill material, spread in specified 6- to 8-in. loose layers, was compacted with four tractor-drawn Blaw-Knox dual sheepsfoot tamping rollers, operating as separate units. Eight diesel tractors, five Caterpillars and three Cletracs, were equipped with bulldozers for leveling fill; the tractors also performed other services, such as pulling the sheepsfoot rollers. Three motor patrols, two Austin-Western and one Caterpillar, worked on fills and on subgrade for the 500-ft.-wide landing strips, finished to 1-in. tolerance.

Drainage System

As part of the grading contract, two natural stream channels in the area were converted to reinforced-concrete pipe sewers to provide the trunk lines for the airport drainage system.

Runoff from the paved areas is de-

(Continued on page 114)

There's money for you in using this new handbook

to save time, trouble and expense in

Estimating, Planning, Constructing Brick Masonry of all types

HERE is the book for contractors, estimators, masons, architects, construction engineers, and all interested in efficient and economical planning and erection of brick masonry construction. It is a professional handbook of the field—full of useful definitions, descriptions, data, diagrams, methods, practical pointers—covering all types of constructions—everything from common and special bonds to estimating the rental cost of scaffolds. Use it for quick access to information that will improve your methods and solve scores of troublesome problems. This dependable manual will help you to estimate brick masonry construction accurately—to meet specifications better—to get quickly the technical details that save you time and expense.

HANDBOOK of BRICK MASONRY CONSTRUCTION

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Mason Contractor and Builder

526 pages, 6x9, 163 illustrations, 219 tables, \$5.00



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The author, regarded as one of the foremost experts on brick masonry construction, consulted by hundreds of construction people and in many court cases, has drawn on his own 30 years' successful contracting and construction experience for the guiding principles, tested methods, dependable job data included here in handy, quick-reference form.

- The book covers bricklaying fully, from the standpoint of producing the most satisfactory, durable work.
- Details of every type of bond, how to make joints, handling work under various conditions, general rules every foreman should know, preparation of mortar—are just a few of the practical topics covered.
- You are given a knowledge of materials that makes for greater protection, closer figuring, better satisfaction in all aspects of planning, estimating, etc. How masonry materials are made, their characteristics, how they perform, how to test them, etc., is made clear with examples and data.
- Concrete construction, use of all types of brick—common, face, hollow tile, and others—stone masonry, architectural terra cotta, etc., are fully covered.
- An important feature is the emphasis given to ESTIMATING—with pointers, formulas, and methods, and scores of tables to help you in quickly determining material, labor, and time requirements, and costs on all types of work.
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The consistent top-flight performance of Preformed "HERCULES" (Red-Strand) Wire Rope is not a matter of chance. Like all wire rope bearing this well-known name, it is made of acid open-hearth steel wire... selected by rigid tests to make sure that it meets our exacting requirements. It is then carefully manufactured according to sound fundamental principles.

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The preforming process minimizes the tendency of Lang's Lay wire rope to loop or squirm.

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Far below . . . a small group of buildings, nestling in the Valley.

And deeper yet, in Earth's massive rock . . . a mine.

Partners in Victory. For the battle five miles up can be won in the mine one mile down, where coal or iron or copper or lead or silver . . . are blasted out of the earth.

It may be an open pit, where the pattern of smoke from a hundred holes tells the story of Primacord—the detonating fuse that is saving powder and man power—and promoting safety—wherever large blasting is done.

Five miles up and one mile down

It may be a mine deep in the rock; men working in the light of their lamps, drilling blast holes . . . charging . . . igniting the rounds of Ensign-Bickford Safety Fuse.

Is this war work? Yes! For *Victory begins underground*, and blasting has a new responsibility, a new purpose: to provide more and *more* and **MORE** of the coal and the metal with which a war is won. The Ensign-Bickford Co., Simsbury, Connecticut.

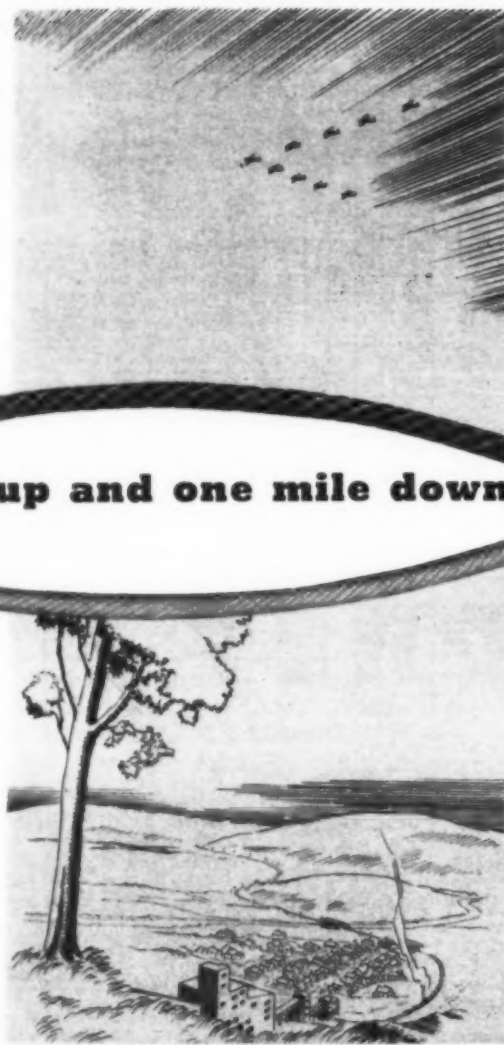
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Since 1836

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Equipment kept in repair has double WAR Value

1 It stays longer on the job, keeps out of the repair shop.

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(Continued from page 112)

livered into the main sewers at manhole junctions from buried edge drain pipe paralleling the two sides of each runway and one side of the taxiways. Surface water on the pavement flows into a shallow, depressed gutter, 8 ft. from the edge of the pavement, and passes into the collecting drain through inlets spaced about 200 ft. apart on the gutter line. An accompanying drawing shows this drainage feature, developed by the Philadelphia District Office of the Corps of Engineers and extensively applied to airports in the district to prevent surface water from eroding and softening the berm at the edge of the pavement.

Paved runways on the airport have a roof crown with a straight slope of $\frac{1}{4}$ in. per ft. from the center line to each gutter. The bottom of the gutter is $2\frac{1}{2}$ in. below the edge of the pavement, and the outer 8 ft. of the paved surface is pitched on a straight slope from the edge to the gutter line.

Inlet surface drainage feeds into the edge drain either through manholes, spaced 400 ft. apart, or through direct connections into the larger pipe at intermediate 200-ft. locations. Subsurface drainage from under the pavement is trapped into the edge drains through bleeders of pervious material installed at manholes and intermediate 200-ft. intervals as indicated by the drawings. Groundwater collected by the bleeders passes into the drain through porous concrete pipe or through the open joints of vitrified clay or concrete pipe laid with half-sealed joints. Poroswall concrete pipe was used in sizes up to and including 21-in. diameter, the largest size in which it was available, and the open-joint construction was used only at the few places where 24-in. pipe was required. Six 3-ft. lengths of pipe were laid at each bleeder, three on each side of a manhole and six in line at the intermediate location. For the porous pipe, the specifications required a minimum permeability of 2 gal. per min. per in. of pipe diameter per ft. of length.

Rock Excavation

Mica schist to a total amount of 50,000 to 60,000 yd. had to be removed in the course of the excavation. The top 2 ft. of the rock could be broken up by roofer for scraper loading, but the remainder had to be drilled and blasted. Using four Cleveland hand-held hammer drills and Timken detachable bits, workmen drilled about 65 vertical 8-ft. holes in 10 hr. A truck-mounted Schramm 210-cfm. compressor driven by a Caterpillar 50-hp. diesel engine supplied air to two drills. Holes were drilled on 10-ft. centers, and each hole was loaded with about ten sticks of Hercules 40 percent gelatin dynamite to break rock to 7-ft. depth, yielding about 5 cu.yd. of blasted material per pound of explosive.

Col. H. B. Vaughan, Jr. is district

(Continued on page 117)

Pumping Station — Mississippi 25' deep in clay and sand—20' of water handled perfectly by Moretrench Wellpoint Equipment.



One we missed—

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8 x 10	15 x 20
10 x 12	20 x 20



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10 OZ. BEFORE WATERPROOFING
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8 x 10	12 x 14
10 x 12	12 x 18
10 x 14	15 x 20
10 x 16	20 x 20



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12 OZ. BEFORE WATERPROOFING
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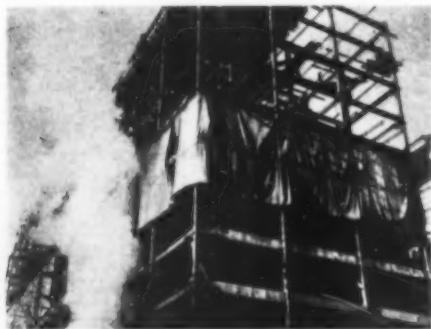
STOCK SIZES

12 x 16	
14 x 16	18 x 24
15 x 20	20 x 20

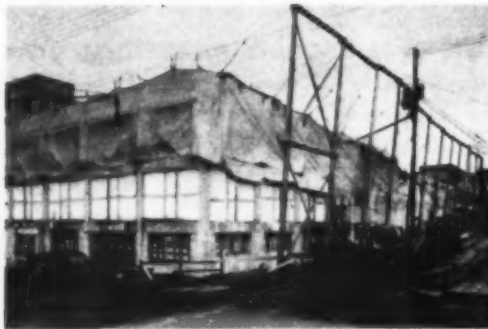


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WITH GENUINE PARA WATERPROOFING

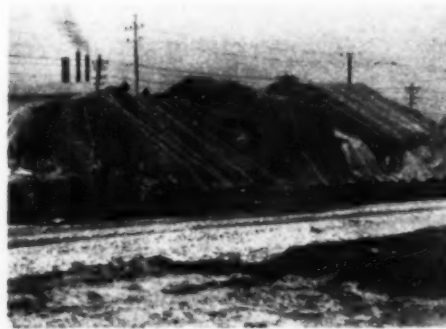
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(Continued from page 114)

engineer in charge of all work for the Corps of Engineers, U. S. Army, in the Philadelphia district, and Lt. Col. F. H. Richardson is chief of the operations divisions. Airport projects in the district are built up under the supervision of Maj. McCown E. Hunt, chief of airport construction. The airport described in these notes was constructed under the immediate direction of S. A. Downey, resident engineer.

James D. Morrissey, Philadelphia, was in active charge of the work on his grading contract. Excavation and grading were under the general direction of Frank Pingitore, superintendent, with Irvin Niessen in charge on the second shift.

★ ★ ★

Blitz Construction

(Continued from page 59)

ing mixers and all the steel forms from the airport job. Five days later, Oct. 15, the two remaining mixers had completed the last of the pavement, with the exception of a few corner fillets. Between Aug. 25, when the first paver started, and Oct. 15, when the last runway pavement was finished, the mixers completed the equivalent of 26 mi. of 25-ft. concrete road.

By the latter date the constructors already had removed the bulk of 120,000 cu.yd. of peat from two muck deposits intersecting the runways and had made a good start on placing 770,000 sq.yd. of stabilized clay-gravel shoulders bordering the runways, taxiways and apron. Work on these features could proceed without offering any interference to the use of the paved areas by planes.

With the exception of the two peat deposits, the soil at the airport site is pervious, well-drained sand, which in itself makes an excellent foundation for concrete pavement. The principal virtue of the stabilized clay-gravel base, from a construction standpoint, was that it furnished a hard surface over which batch-trucks could haul to the paving mixers without danger of bogging in sand. This advantage contributed directly to the speed of the paving work.

Clay-gravel for the stabilized base was mixed by skillful loading of the excavator buckets in a natural borrow pit containing adequate proportions of gravel, sand and clay. Trucks hauled the mixture 6 mi. to the airport, where it was dumped on the grade to be struck off by bulldozers and blade machines. Pneumatic-tired rollers, operated in conjunction with blade drags, compacted the material in the 5-in. stabilized base.

To speed construction of the stabilized base, the clay-gravel material was struck off and compacted to uniform

(Continued on page 118)

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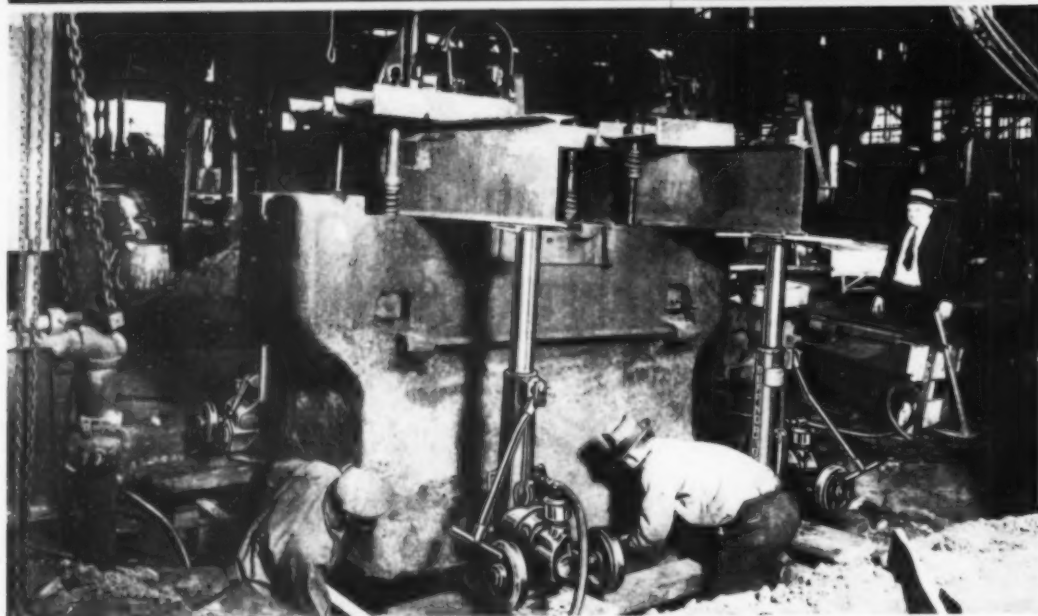


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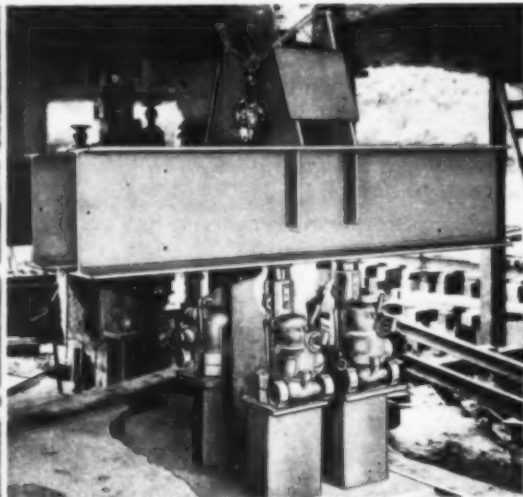
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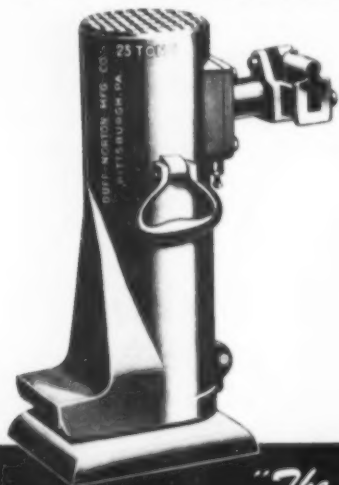
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(Continued from page 117)

5-in. thickness, without any adjustment of the top surface to fit the bottom profile of the 25-ft. paving lanes of 10-7-10-in. cross-section. This necessary adjustment was made for each lane by placing a sand cushion on top of the stabilized mat. Specifications permitted a variation of plus or minus 0.2 ft. in the grade of the base. To avoid the slow, difficult task of scarifying the dense base material, an operation which tended to retard subgrade preparation for paving, the constructors followed the practice of building the stabilized base a trifle low. On top of the 5-in. base, strips about 4 ft. wide of clay-gravel then were placed along the form lines to be compacted and finished to precise grade to support the steel forms. Between these strips, the subgrade was built up with sand fill to the bottom profile of the pavement.

Concrete Pavement

Each of three runways 5,000 ft. long is paved 150 ft. wide with six 25-ft. lanes of 10-7-10-in. concrete. The 10-in. thickened edge tapers to 7 in. in 3 ft., except at the outer margins of the pavement and adjacent to the longitudinal center-line expansion joint, where the thickened edges taper from 10 in. to 7 in. in 12½ ft. Transverse expansion joints of ¾-in. premolded, asphalt-impregnated fiber were made up on the job with dowel assemblies and were installed in the pavement on 100-ft. centers. Between the expansion joints, transverse contraction joints of the slot type were cut 3 in. deep into the fresh concrete on 20-ft. centers and were filled with premolded strips of bituminous material. A center-line contraction joint of the same type was installed longitudinally in each 25-ft. lane and was filled with premolded bituminous ribbon. Construction joints between lanes are the keyed, tongue-and-groove type.

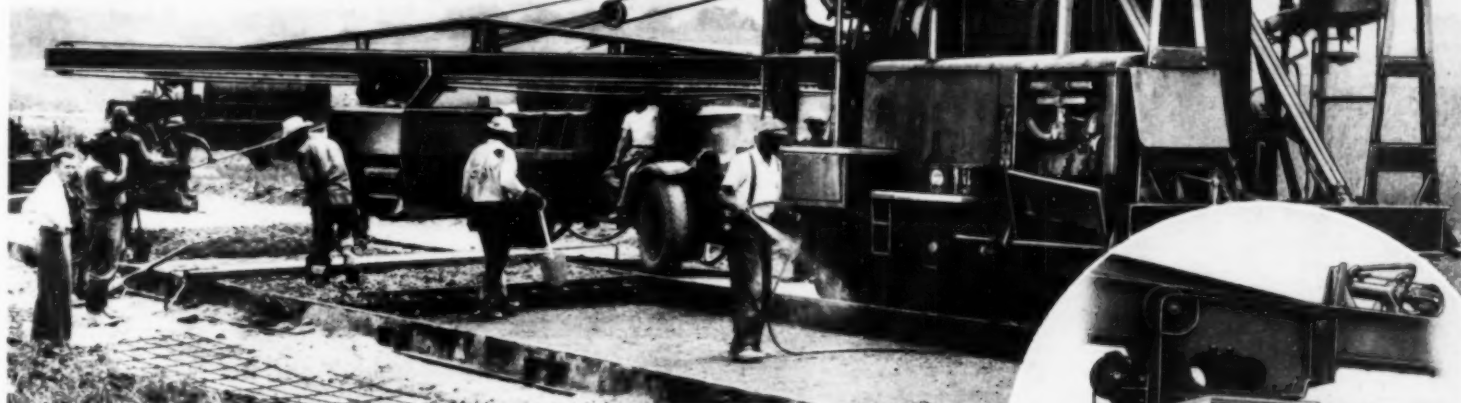
Runways are flanked on both sides by stabilized clay-sand-gravel shoulders 175 ft. wide. With 150 ft. of pavement, the stabilized shoulders provide a total landing-strip width of 500 ft. The runway design calls for a straight roof crown pitched both ways on a 1 percent grade from the center line of the pavement to the outer edge of the shoulders. Longitudinally, the runways conform to the contours of the site. The longitudinal grades are low, the maximum being less than 0.5 percent.

Concrete for the pavement was designed with 5½ sacks of cement per cu. yd. to produce a minimum compressive strength of 2,500 lb. and a modulus of rupture of at least 650 lb. per sq. in. at 28 days. Test specimens greatly exceeded these requirements, beam breaks at 7 days giving values for modulus of rupture of 675 to 700 lb.

Specifications required that each batch be mixed for 60 sec. Batches

(Continued on page 120)

*Swing Boom and spread
at the same time -
Eliminate split batches -
Save mixing time -*



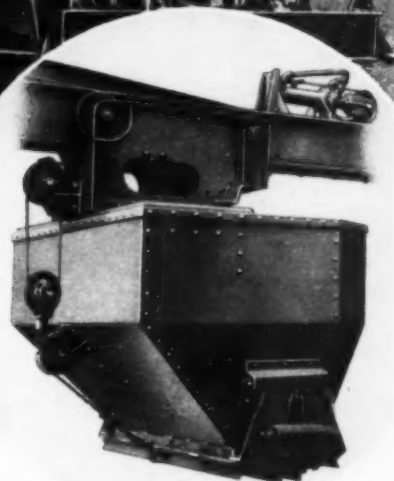
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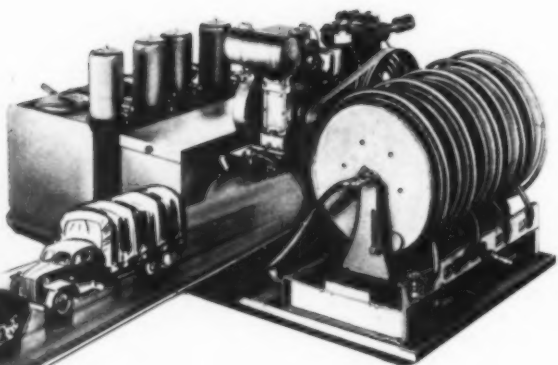
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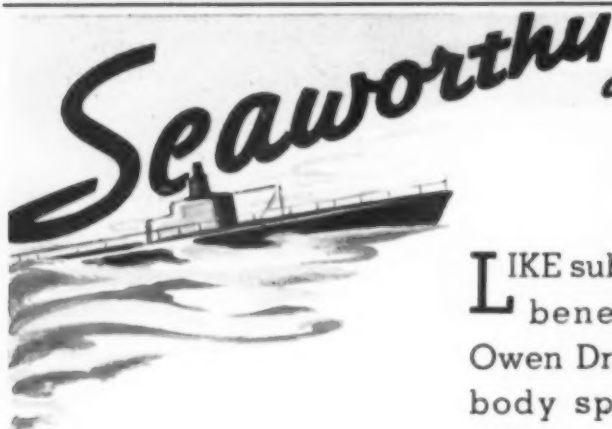
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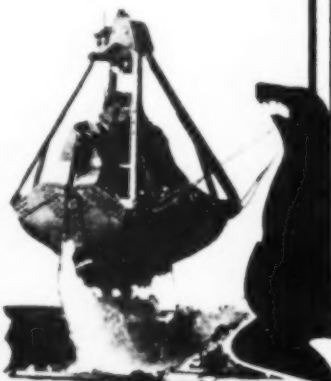
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OWEN BUCKETS
A MOUTHFUL AT EVERY BITE

(Continued from page 118)

mixed by the 27E pavers were the maximum allowable size, 33 cu.ft., and the average production of these mixers was about 40 batches an hour. This rate was nearly doubled by the 34E dual-drum, which turned out an average of 75 to 80 batches an hour, with the hourly production frequently running higher than the latter figure. Because of the fast output of the dual-drum, the finishing crew had difficulty in keeping up with the paver, and the batch size for this machine was held to a volume of 34.36 cu.ft., containing 658 lb. (equivalent to 7 sacks) of cement.

Laying slab in a 25-ft. lane, the big paver completed as much as 1,955 lin.ft., 5,430 sq.yd., in 11 hr. This progress called for a sustained average production of slightly better than 77 batches per hour. Ordinarily the 34E dual-drum operated 10 hr. per day. The smaller 27E pavers usually ran 12 hr. On a good day, a 27E single-drum paver would place 1,100 lin.ft. of 25-ft. lane, equal to 3,055 sq.yd. Average production of nearly 42 batches per hour was required to make this advance.

On a few days, an old 27E paver worked in combination with a newer mixer of the same size, one unit traveling outside the forms and the other on the subgrade. The older mixer, which had long passed its prime, was not a reliable producer. When teamed with the newer paver, however, it added something to the average day's production, enabling the combination to make about 1,200 lin.ft. in 12 hr.

Stabilized Shoulders

Design of the 175-ft. shoulders flanking the pavement called for 5 in. of stabilized material for 10 ft. from the pavement edge (totaling 48,000 sq.yd. for the job) and 3½-in. thickness for the remaining 165 ft. (totaling 720,000 sq.yd.). To facilitate later top-soiling and seeding, the finish grade of the stabilized material is kept 2 in. below final grade of the shoulders. At the pavement edge, the 5-in. stabilized layer is thickened to 7 in. to bring it up to pavement grade.

Stabilized material for the shoulders is turned out by two portable crushing plants at a gravel pit 6 mi. from the airport. Clay for the stabilized mixture is hauled from another site to the gravel pit and is fed to the crushing plants in the proper proportion to produce a soil binder with the desired plasticity index of 8 to 12. Two Northwest 1-yd. draglines load the raw material hoppers of the crushing plants.

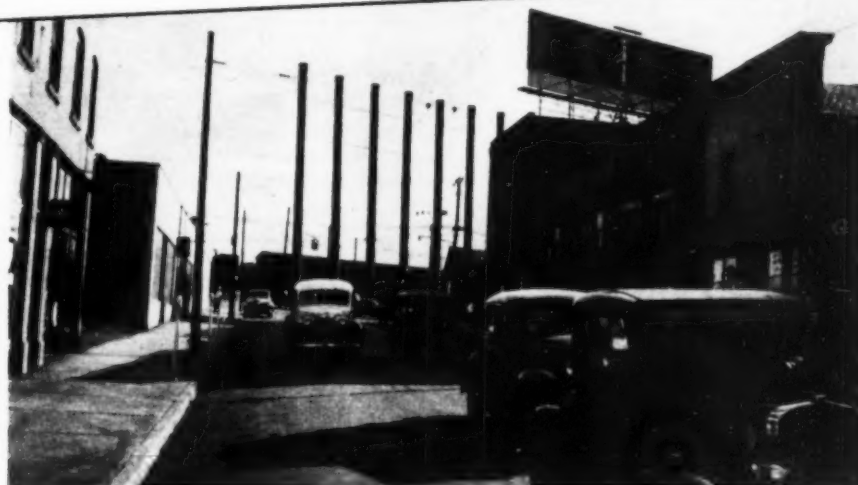
Production of stabilized mixture started with a single portable crushing plant in operation. This unit is a large Pioneer 48V duplex outfit which maintains an average production of 200 yd. per hour and attains a peak output of 300 yd. Clay is fed from a hopper to the main belt of this plant by an auxiliary conveyor. The crushing plant is driven by a truck-mounted Caterpillar diesel

(Continued on page 122)



Two views of Watt Street, Youngstown, O., which is paved with TEXACO Asphalt. Note blast furnace stacks in background.

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GATKE CORPORATION
226 N. LaSalle St. Chicago

(Continued from page 120)

engine. A smaller Cedar Rapids portable crushing plant is set up at the pit as a reserve mixing unit to increase production of stabilized material for shoulders.

With the exception of the two peat deposits, earth moving on the relatively level site presented no problems. A scraper fleet composed principally of Caterpillar 96-hp. diesel tractors and LeTourneau 10-12 yd. Carryalls handled the 256,000 cu.yd. of grading. Different methods were needed to remove the 120,000 yd. of peat from pockets up to 20 ft. deep.

Two Northwest 2-yd. draglines excavated the peat and loaded it into trucks. One deposit about 400x800 ft. in area contained about 100,000 yd. of the unstable material. One of the runways crossed the center of this area. To prepare a foundation for the runway at the earliest possible date by removing the peat and backfilling with sand, the contractor first worked the two draglines through the center of the pocket on timber pads, making a cut which was backfilled by trucks dumping from the two ends. This fill provided a road for trucks loaded by the two draglines as they made successive cuts on both sides of the fill. Working a double shift, the two draglines averaged 2,500 yd. in 18 hr.

War censorship unfortunately requires that the names of the men in charge be withheld until victory is won.

★ ★ ★

Waterfront Modernized

(Continued from page 55)

of the Willamette River. Between the seawall and Front Ave., ground was made by dredging, and it is throughout this area that Harbor Drive has been constructed. The drive, in general, consists of six paved lanes, plus two parking lanes. Opposite-bound traffic is separated by a 4-ft. concrete island. In addition to Harbor Drive, Front Ave. itself has been widened to 80 ft. In doing this, all buildings had to be removed on the east side of Front Ave., except the modern Public Market Building, extending from Morrison to Salmon Sts. This building was constructed with a setback line to give the required 80-ft. width for Front Ave., and also allow the construction of Harbor Drive between the building and seawall. It was necessary, however, along the Market Building, to reduce Harbor Drive to four lanes. The area between Front Ave. and Harbor Drive, varying in width, is designed for landscaping. This feature, however, has been postponed until after the war. Morrison and Hawthorne bridges connect east and west Portland. The traffic from these structures empties into Front Ave., and the bridges are

(Continued on page 124)

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MARMON-HERRINGTON CO., Inc.

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(Continued from page 122)

connected to Harbor Drive, which passes under the bridge approaches, by partial clover leaves.

All work to date, except for the widening of the bridge approaches, has been done under three contracts, totaling a bid price of \$650,000. Edlefsen-Weygandt Co., of Portland, was the low bidder on all three jobs. In order to allow Harbor Drive to pass under Morrison bridge, it was necessary to raise the west approach 7 ft. This work was done by Birkemeier & Saremal, at a cost of \$106,500. It was not necessary to raise the Hawthorne bridge approach, but it was widened to allow construction of ramps to Harbor Drive. This contract totaled \$31,120 and was done by Lindstrom Bros., of Portland.

Buildings Razed

The wrecking of the buildings in the 18 blocks from Davis to Clay Sts. was included in the general contract. The bid price for this item was \$76,000 with the additional compensation to the contractor that he was to retain all salvaged material. This was a sizeable item, as the buildings contained approximately 10,000,000 bricks, and many tons of steel and iron. Most of the buildings possessed deep basements, and the specifications for backfilling these were rigid. The contractor was allowed to use bricks for this purpose with the following restrictions: Bricks were to be placed in layers, not exceeding 2 ft. in depth. Over this, river sand was spread, on a basis of 30 percent voids in the bricks. The sand was washed into the voids with a fire hose carrying normal hydrant pressure. The basement walls were broken to a point 2 ft. below sub-grade. As each layer of brick and sand was placed, a hammer weighing not less than 1,500 lb. and dropped from a height of 10 ft., was used to obtain compaction adjacent to the wall. The remainder of the basement area was compacted by the use of bulldozers.

The procedure followed in wrecking buildings was to remove the roof and strip the interior between floors. The problem of lowering this material, as well as pulling down the walls, was effectively solved by the use of a double-drum Hyster winch on a Caterpillar D2 tractor.

All pavement on Harbor Drive is portland cement concrete, with a uniform thickness of 7 in. Oswego portland cement was used, with the aggregates being manufactured by the Ross Island Sand & Gravel Co. A 27-E mixer was used for all concrete mixing.

The resurfacing of Front Ave., over the existing cobblestones, as well as the widened portion, was paved with asphaltic concrete, using a 4-in. Class B base with 1 in. of Oregon State Highway Department cutback surfacing. All bituminous paving was subcontracted to the Cascade Construction Co. A Barber-Greene paver was used.

(Continued on page 126)

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Finishing ahead of schedule means only one thing—SPEED. That's how the Parsons' Trenchers have built and will continue to build a home defense that will not be penetrated by the enemy.

With sixteen digging speeds ranging from eleven to thirty-nine inches per minute how could they help but be a home defense weapon. Add to this sixteen forward speed changes and four different reverse accelerations. The traveling speed of these rugged metal soldiers is one and three-fourths miles per hour. An added speed feature is the two speeds on the bucket line. For SPEED as well as clean and deep digging, Parsons has been the accepted standard for over thirty-five years.

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TRENCHING EQUIPMENT



Mobilize Construction Manpower

When there aren't enough men to go around, give those you have all the help you can. There's no better way than to supply them with plenty of jacks for the endless pushing, supporting, raising, lifting and lowering jobs that are part of every construction job.

Simplex Jacks provide that extra margin of safety that defeats the 6th Column — Accidents. Every jack in the line — lever, screw, hydraulic, geared and journal and push-pull jacks and Simplex trench braces — have not one — but many — exclusive safety features that have won the commendation of employers, workers, inspectors and insurance firms — and yet they cost no more than ordinary jacks; often less. See them all in Catalog 42.

TEMPLETON, KENLY & CO.
CHICAGO, ILL.

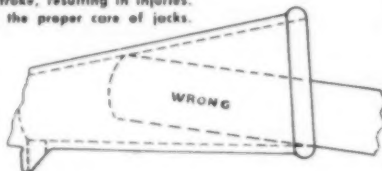
Better, Safer Construction Jacks Since 1899



Make Your Jack Last Longer!

It pays off and, besides, war requirements call for conservation.

A suggestion: When using lever jacks, be sure lever bar or pole is correct size and is nested in socket; the wrong size can damage socket or slip out on the down stroke, resulting in injuries. Send for bulletin on the proper care of jacks.



(Continued from page 124)

All construction work was handled on a federal-aid basis. The main items on the three contracts under construction are as follows: Building wrecking, \$84,000; general excavation and borrow, 137,500 cu. yd.; removal of pavement, 15,500 sq. yd.; sand backfill in basements, 8,500 cu yd.; sewer pipe, all sizes, 18,000 lin. ft.; concrete sidewalks, 17,000 sq. yd.; concrete pavement, 61,000 sq. yd.; asphaltic concrete pavement, 15,800 tons; foundation rock, 35,000 tons.

The following equipment was used by the contractors: 9 International 5-yd. trucks; 2 RD8 Caterpillar tractors; 1 RD7 Caterpillar tractor; 1 RD2 Caterpillar tractor; 1 LeTourneau 14-cu.yd. scraper; 1 LeTourneau 24-cu.yd. scraper with dozer attachments; 1 27E Rex concrete mixer; 1 Caterpillar blade #112; 1 2B Bucyrus power shovel; 1 Lakewood finishing machine; 1 Barber-Greene finishing machine.

For the contractors, Gordon Weygandt was the spark plug, with Bud Munson, construction superintendent. The State Highway Department was represented by R. H. Baldock, chief engineer, H. G. Smith, construction engineer, G. S. Paxson, bridge engineer. J. T. Skelton and L. C. Smitten were resident bridge engineers on the construction of bridges and subways, respectively. The writer was resident construction engineer, and, later, acting division engineer. D. J. Barbee was transitman.

★ ★ ★

Movie Shield "Tunnel"

(Continued from page 52)

improve the acoustical characteristics of the tunnel set. Dummy bolts and nuts for the lining were all made of wood and the washers were of heavy cardboard. Actually, the rings of lining were nailed together; the bolts did not pass through the flanges of the ring segments but were accurately spotted on each side of the flanges and nailed to them, producing a realistic effect.

The shield itself was a reproduction, in wood, of one used by the Walsh Construction Co. on the Queens-Midtown Tunnel under the East River, New York. Its details were designed from photographs and blueprints of the real shield. It was equipped with a wood erector arm for placing the segments of the lining. This arm was mounted on a horizontal shaft which extended through the back of the shield and was rotated by operating a hand wheel screened from view of the camera. The tunnel was open at the top to permit

(Continued on page 128)

ARMSTRONG



DROP
FORGED
WRENCHES

In construction work there's no telling what strain a wrench may be subjected to, that's where it pays to invest on ARMSTRONG Drop Forged Wrenches — the wrenches with a wide margin of extra strength. Improved in design, drop forged from special carbon steels, heat treated, hardened, tempered to the correct point of stiffness and toughness, they make work easier, faster and safer. Over 100 types, including Carbon and Alloy Steel Construction and Structural Wrenches and Ratchets. Each type in all sizes.

Write for Catalog
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
334 N. Francisco Ave., Chicago, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

Get this
**EXTRA
VALUE**
in
SHOVELS!



ASK
for the
**ONLY
SHOVELS**
with

Blade Edges
**GUARANTEED
SPLIT-PROOF**

INGERSOLL SHOVELS
"The Borg-Warner Line"

Write for Catalog and Prices
INGERSOLL STEEL & DISC DIVISION
BORG WARNER CORPORATION
NEW CASTLE, INDIANA
Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.



18,000 MONOTUBES

Driven for Large Midwestern Steel Plant



ALARGE midwestern steel company recently used 18,000 tapered Monotubes in the construction of three new projects.

In Chicago, Monotubes were chosen because of their extra strength and rigidity. Driving had to be done through a clay formation to sand and gravel, much of it in ground filled with "skulls"—and that requires piles that can "take it"!

In Youngstown, Monotubes were considered best because of a confined and congested working area. Only piles that could be easily and swiftly handled with light, mobile driving equipment would suffice—and that's one of the chief qualities of Monotubes.

In Cleveland, Monotubes were used because of unforeseen ground conditions where length variations ran

as high as 100%—requiring flexibility as well as structural strength.

The experience of the engineers and contractors on these three jobs proves the Monotube features of (1) fast handling; (2) fast driving; (3) fast extension; and (4) ease of inspection.

Engineering & Design

Cleveland . . . United Engineers & Constructors, Phila.; also the owner's own engineering department.

Youngstown . . . United Engineers & Constructors

Chicago . . . James Stewart & Co., New York City (also Gen. Con.)

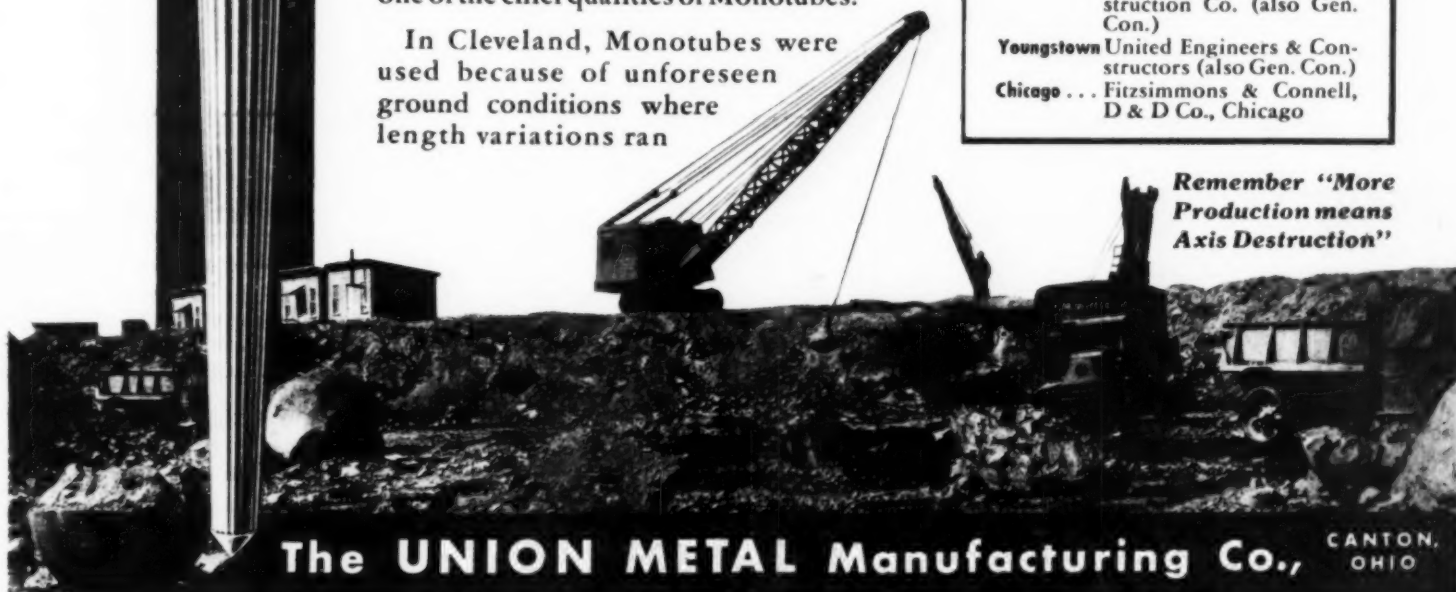
Pile Driving Contractors

Cleveland . . . United Engineers & Constructors (also Gen. Con.)
Hunkin-Conkey Construction Co. (also Gen. Con.)

Youngstown . . . United Engineers & Constructors (also Gen. Con.)

Chicago . . . Fitzsimmons & Connell, D & D Co., Chicago

**Remember "More
Production means
Axis Destruction"**

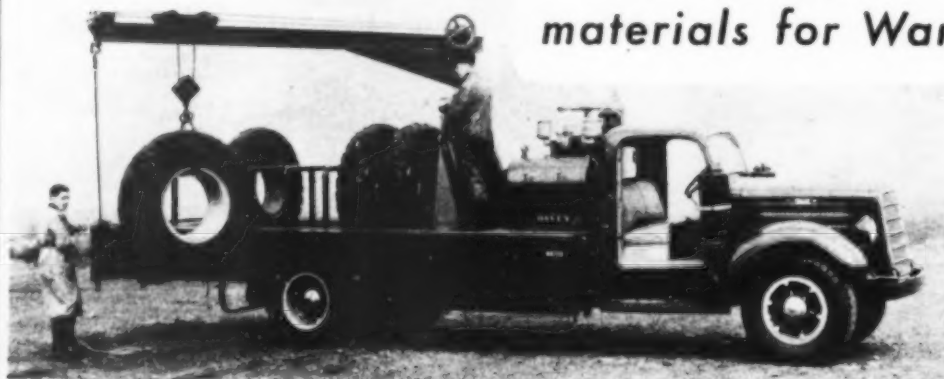


The UNION METAL Manufacturing Co.,

**CANTON,
OHIO**

CONSERVES STEEL...!

*makes available large amounts
of critical
materials for War*



DAVEY *Split Propeller* HEAVY DUTY TRUCK POWER TAKE-OFF

The use of the Davey split propeller power take-off eliminates entirely the need for a secondary gasoline engine for driving truck mounted equipment, saving space, weight and critical materials.

It provides dependable power for compressors — welders — power generator sets — and special applications like the truck illustrated which has a winch and compressor combination. The compressor is operated from the power take-off to inflate tires on heavy duty construction equipment.

Thus your truck serves as a mobile unit and supplies power for auxiliary operations. This dual service saves vital war materials too.

FOR EXAMPLE, on an order of 165 trucks for the armed services the following economies were made.

- | | |
|--|---|
| 1. Saving of approximately 250 tons of steel and alloys. | 6. More economical use of either 1½ or 2½ ton Army vehicle, with consequent savings of rubber and fuel. |
| 2. Saving of 30,000 to 40,000 manhours of labor. | 7. Dual purpose use of vehicles. |
| 3. Saving of transportation facilities. | 8. Standardization of service parts for engines. |
| 4. Saving of space in military transports. | |
| 5. Greatly improved portability of equipment involved. | |

This is typical of the savings possible by the use of Davey split propeller power take-offs.

Davey also builds a full line of heavy duty portable and industrial compressors, pneumatic saws and pole hole diggers.

DAVEY COMPRESSOR CO.
Power Take-Off Division
KENT . . . OHIO . . . U.S.A.

(Continued from page 126)

suspension of platforms and other equipment from which the cameramen shot scenes at desired angles.

The scenic equipment, however, was not all synthetic. Tunnel track of 24-in. gage, including a California switch, two General Electric 4-ton locomotives and six muck cars, had been used by the L. E. Dixon Co., contractor of Los Angeles.

One of the dramatic scenes called for by the film script involves that bane of compressed-air tunnel workers, a blow-out, which occurs while Miss Colbert, the intrepid magazine photographer, is up near the shield taking pictures of the sand-hogs mucking out the face of the bore. In the interests of realism Director Leisen demanded an inflow of real muck through the doors of the shield. To produce this effect there was constructed in back of the shield a wooden tank 40 ft. high with an outlet at its bottom controlled by a large valve and connected by a chute to the doors of the shield. This tank was filled with wet adobe mud and at the critical moment of the blowout its contents, under a 40-ft. head, were released and surged through the shield into the tunnel.

"Extras" as Sandhogs

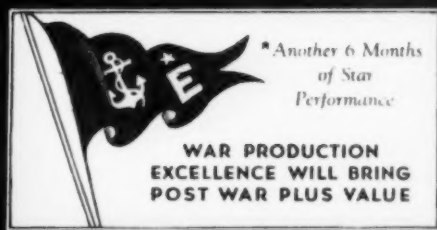
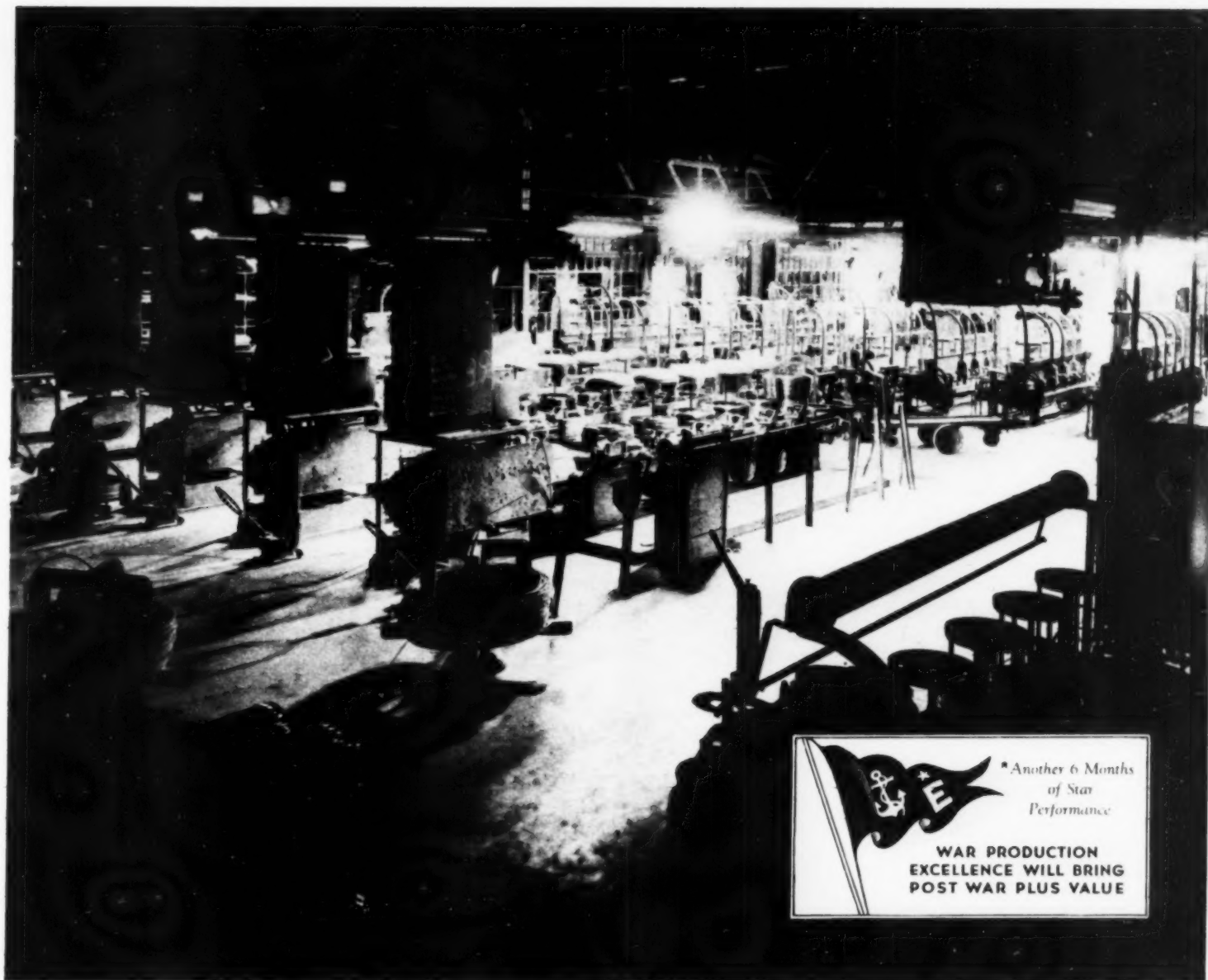
Among Mr. Wall's duties as technical mentor was the selection from a group of several hundred "extras" of a crew of sand-hogs who looked the part. The candidates were lined up on the 150-ft. long stage and as they passed along in single file before the director's reviewing stand a crew of tough looking hom-bres to serve as muckers and members of the iron gang portrayed in the film was winnowed out from the throng of "extras" The haul included a few professional wrestlers and ex-prize fighters. Playing the part of the contractor's engineer in the screen play was Rod Cameron, himself an engineer who had formerly served on the technical staff of the Westchester County Sewerage Commission, New York.

Miniature Tunnel

While much of the action of the play was staged in the 50-ft. long section of the big 27-ft. diameter tunnel, it was necessary, for photographic purposes, to supplement this full-size tube with a miniature tunnel built of plaster of paris to a scale of one-sixth size and painted to portray a tunnel interior. This toy tube was built as a half-section, open on one side, and was about 4¾ ft. in diameter and 80 ft. long.

In the big blowout scene, Mr. Wall reports, the attractive Miss Colbert disdained the services of a double and wallowed waist deep in the liquid muck which poured through the doors of the shield before her timely rescue by Fred MacMurray. Even as she emerges from the ordeal of her mud bath, as shown in one of the illustrations, the smiling

(Continued on page 130)



PULLING WIRES FOR PEACE!

Mile after mile of wires are being processed to speed the war effort and to hasten peace.

Day and night, the finest of steel passes through scientifically-controlled patenting furnaces, steaming vats that clean and coat, and baking ovens that dry and degasify. With unrivalled skill, through dies of jewel-like precision, it is drawn down to wire.

With scarcely a pause, spools of it in great numbers are cradled in the awesome whirr of robot-like stranding and laying machines. There, just as steadily as they were drawn down, wires are laid up again, first into strands and then into rope. In each process, strength is gained to supply tough, flexing sinews for machines which multiply and quicken man's capacity ten thousandfold.

As never before, with ever-increasing skill, our craftsmen are producing tough steel tendons for fighting machines. Before there can be war machines, however, ores, oil, coal and stone must be mined. Steel and metals must be made, lumber logged, war plants constructed and fitted. Then there must be highways, seaports and airports hewn out of the earth around the globe.

Think! Try to imagine what a limitless, hopeless, man-killing job it would be without modern wire rope to do the digging, shoveling, hoisting and countless other burdensome tasks. Then resolve to use your wire rope with great care.

UNION WIRE ROPE CORPORATION
2160 Manchester Ave., KANSAS CITY, MO.

Tulsa • Houston • Chicago • Salt Lake City • New Orleans • Monahan
Portland • Ashland, Ky. • Atlanta

C-43

SEND FOR ROPE DOPE • Tells how to make wire rope last longer—how to handle and install it—how to socket or splice—and a wealth of other helpful information. Engineering information supplied without obligation.

WHEN YOU NEED PREFORMED WIRE ROPE
SPECIFY **union-formed**



union
Wire Rope

"THE ULTIMATE LOW COST WIRE ROPE"

January 1943 — CONSTRUCTION METHODS — Page 129



ARMY
(E)
NAVY

The credited Army and Navy E Pennant awarded for excellence in production now floats proudly above the Wellman plant.

WILLIAMS Buckets

ARE BITING INTO FROZEN GROUND and TROPIC MUCK

● Williams Buckets are very much in active service in the wide-flung war offense. Concrete-hard, frozen ground is being broken by the sharp teeth of Williams Buckets in far north road building. Deep in jungles Wellman Buckets are digging and dredging. At ore mines, over stock piles and railway cars, and in steel mills Williams Buckets are literally moving mountains to help beat the Axis.




built by

THE

WELLMAN

ENGINEERING

COMPANY

7017 CENTRAL AVENUE
CLEVELAND, OHIO

The Care and Feeding of Rock Crushers

Reverse Worn Jaw Plates For Maximum Service . . .

Jaw plates are made reversible so they can be turned end for end when the lower end becomes worn. Jaw plates should be reversed as soon as they have become worn to a point of decreasing plant capacity—worn jaws will not grab and crush material. They cause material to slip and accelerate wear. Too, wear forms pockets at base of jaws preventing release of material and decreasing capacity. Check plates and wedges should be reversed, too (older models of equipment do not allow for this change) when jaws are reversed, for maximum efficiency and service.

Most worn jaw plates can be salvaged by build-up welding and the use of filler bars. You boost production when you keep corrugations at the lower end of the jaws—you conserve vital metal when you build up worn jaws.



No. 2 of a series of advertisements in the interests of national economy to aid users of crushing equipment unable to secure new units during the emergency.

UNIVERSAL ENGINEERING CORP.
(formerly Universal Crusher Co.)
327 8th STREET WEST CEDAR RAPIDS, IOWA

UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

(Continued from page 128)

Miss Colbert seems to the writer of these notes to have lost none of her glamour.

West Coast Flight Strip

(Continued from page 51)

watering and rolling; all the material passed a 3-in. sieve.

Bearing value at 0.1 in. pen. (soaked)	40% or more
Expansion	2% or less

The cementing value for the top 4 in. is not less than 100 lb. per sq. in.

Material was placed in maximum 4-in. loose layers and compacted to at least 95 percent relative compaction. Tamping rollers were specified.

Gravel Base—Placed immediately underneath the plant-mix surfacing, the gravel base extended 1 ft. to each side (152 ft. wide). The material was a natural mixture of gravel, sand and binder in proper proportions to bind and compact into a stable, durable base under watering and rolling.

Bearing value at 0.1 in. pen. (soaked)	80% or more
Cementing value, lb. per sq. in.	60% or more
Expansion	2% or less

Swell (when SC-2 liquid asphalt is added) 0.030 in. or less.

It was not required that the base material be screened or crushed. Gradation specifications called for a maximum size passing a 2-in. sieve and retained on a 1/2-in. sieve. Not more than 60 percent was to pass a No. 4 sieve, with 3 to 11 percent passing a 200-mesh sieve. Loose depth of layers before compaction was not permitted to exceed 6 in.

Plant-Mix Surfacing—Before paving the runway, the area to be treated was primed with an application of liquid asphalt, type SC-2, 1/4 gal. per sq. yd. Paving asphalt, 120-150 penetration, was specified for the surfacing. Maximum temperature allowed for the asphalt was 350 deg. F. Spreading was done with a self-propelled mechanical spreader in not less than 12-ft. widths. Pneumatic-tired rollers were required for compacting. The compacted thickness of 3 in. was spread in two equal courses, and the area was sealed with 0.1 gal. asphaltic emulsion.

War-Battered Roads

(Continued from page 71)

ous plant mix blanket, placed in two courses, the total depth averaging 2 in. for a width of 22 ft. The first or leveling course of bituminous surfacing was placed with power graders and the second or top course with a mechanical finisher.



**IT'S HARD
TO GET STEEL
but you
can get
DRAINAGE**

America at war can afford no interruption of vital traffic. Proper drainage is doubly important now. Yet desirable as it is, steel must not be used in any drainage structure unless engineering integrity demands it. Even so, perhaps we can help you in other ways.

For example, ARMCO Emergency Pipe may be just the answer to your wartime drainage problems. This completely new design in wood pipe requires no steel sheets, bands, wire

mesh or metal reinforcing. It is easy to handle and has ample strength to meet engineering standards. ARMCO Wood Pipe is designed to last through the emergency. On more permanent installations, when replacement becomes necessary, a corrugated metal pipe may easily be threaded through or jacked around the wood structure.

Remember that ARMCO Corrugated Metal Pipe is only on temporary "leave of absence." It will be back with its flexible strength, ease of handling,

tight joints, long lengths and low installation costs. Asbestos-Bonded Coatings and thick bituminous pavements will be back too—better than ever before—to guard against corrosion and erosion.

Meanwhile, can we assist with your drainage problems? The answer may be in the use of non-strategic materials, or in suggestions for repairing and salvaging older structures. Write to us. Armco Drainage Products Assn., 25 Curtis Street, Middletown, Ohio.

ARMCO



EMERGENCY PIPE

Here Is Your Nearest Worthington Distributor

For Sales, Rentals and Service
on **BLUE BRUTE** Portable Compressors,
Rock Drills and Air Tools. Get your
EQUIPMENT-SAVER — FREE
see full page ad on Back Cover

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ARIZONA
Phoenix — Smith Booth Usher Company
ARKANSAS—Fort Smith — R. A. Young & Son
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Los Angeles — Smith Booth Usher Company
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WORTHINGTON

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HOW AND WHY WILLIAMS' TOOLS AID WAR PRODUCTION

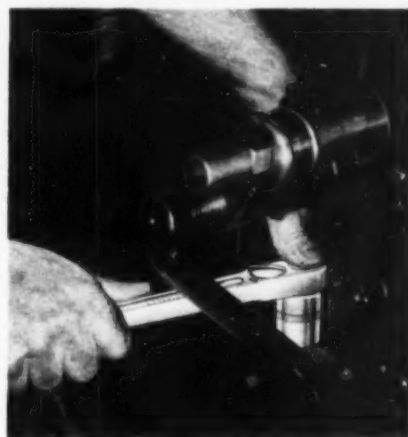
J. H. WILLIAMS & CO., Drop-Forgings and Drop-Forged Tools, BUFFALO, N. Y.



SPEED. Much time is saved on this machine assembly job with this "Supersocket" combination. The operator quickly tightens a long row of cap screws while standing erect. Wrench assembly consists of S15P Speeder Handle, S110P Extension Bar and Socket.

SAVING TIME WITH "SUPERSOCKETS"

● Detachable Socket Wrenches offer two inherent advantages which should not be overlooked today. Because of their basic design which provides for the assembling of the various components, Williams' "Supersockets" permit the user to assemble what amounts to a special wrench for the particular job at hand. Thus a faster, and often safer, wrench is provided as shown in the several Socket Wrench applications illustrated. Vital man-hours can be saved on many manufacturing, maintenance and repair operations by the use of a suitable "Supersocket" combination.



OBSTRUCTIONS like this would present quite a problem for any other type of wrench, and would undoubtedly require removal of the bracket in the foreground. Wrench assembly consists of S51 Ratchet and Socket. This Ratchet will permit rotation of the nut when handle swing is limited to as little as 30°.



SAFETY. A slip of the wrench could be serious for this millwright working on an overhead lineshaft. His "Supersocket" Wrench not only gets to an awkwardly-placed nut but, in completely encasing it, makes slippage practically impossible. Wrench assembly consists of S20A Sliding T Handle and Socket.

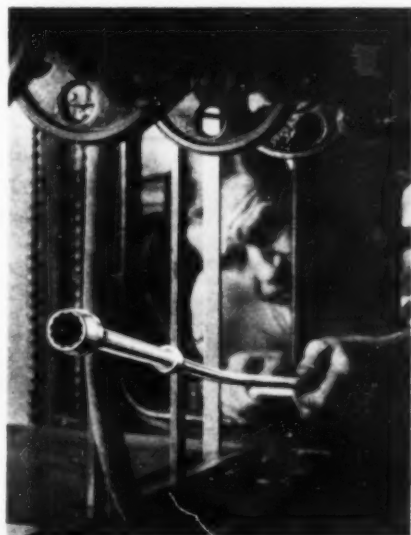
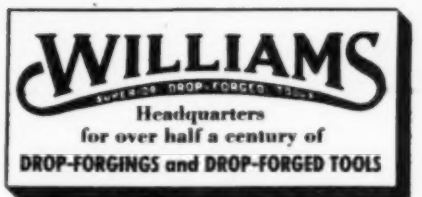
A FEW TYPICAL HANDLES & PARTS



A FEW TYPES OF SOCKETS

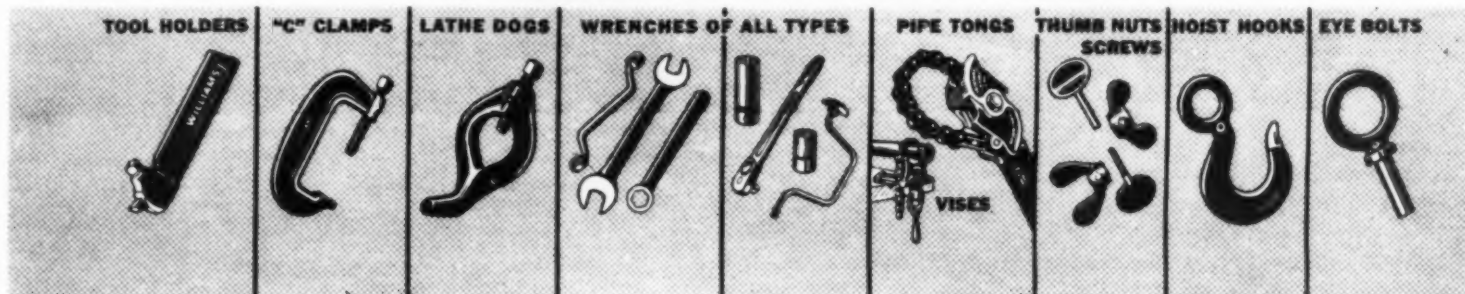


Williams' "Supersockets" are made in 5 patterns. Sold singly and in complete sets.



HARD-TO-REACH places are "duck soup" for "Supersockets." This workman will save a lot of time that otherwise would be consumed in disassembling the machine in order to reach the particular bolt that needs tightening. Wrench assembly consists of S15P Speeder Handle, S115P Extension Bar and Socket.

Sold by Leading Industrial Distributors Everywhere



WHERE TO BUY

Featuring additional Products and Specialties for the Construction Industry

C.H. & E.

No. 33 PORTABLE SAW RIG



• Tilting Table • Swing Arbor—Straight Line • All Welded Construction • Ball and Roller Bearings • V Belt Drive

C. H. & E. MANUFACTURING CO.
3847 N. Palmer St., Milwaukee, Wis.

'Ramsey' 3-SPEED ALL-STEEL HAND WINCH

2
Sizes
•
5-ton capacity — 135-lb. spools, 225' of 1/2" cable \$85
3-ton capacity — 75-lb. spools, 150' of 1/2" cable \$40

POWER FOR
HEAVY LOADS. SPEED.
FOR LIGHT LOADS.
Gear Ratios: 25:1,
4:1, 1:1.

Write for circular and name of nearest dealer

A few territories are open for live distributors

Manufactured by
RAMSEY MACHINERY CO.
1626 N. W. THURMAN STREET PORTLAND, OREGON

COMPLETE WELL POINT SYSTEMS WILL DRY UP ANY EXCAVATION

Faster—More Economically
Write For Job Estimate and 32 page Catalog

COMPLETE

MACHINERY & EQUIPMENT CO., Inc.
36-36 11th St., Long Island City, N. Y.
Tel. IRonsides 6-8600
Branch: Third Avenue & Adams St., Gary, Indiana
Telephone: Gary 23983



Concrete VIBRATORS and Grinders
Write for Circular on types, sizes and prices

White Mfg. Co.

ELKHART

INDIANA

STERLING PUMPS

Simple, Dependable,
Rugged—that's why
Sterling Pumps, Pumps
and Light Plants are
the choice of leading
contractors and in-
dustrial users every-
where.

**YOU'LL
GET
BETTER
RESULTS
WITH
STERLING**

Write for
Literature

STERLING MACHINERY CORP.
405 13 Southwest Blvd. Kansas City, Mo.

This WHERE TO BUY Section

supplements other advertising in this issue with these additional announcements of products and specialties essential to modern construction and maintenance of equipment. Make a habit of checking this page, each issue.

DEPARTMENTAL STAFF
CONSTRUCTION METHODS

NEW ADVERTISEMENTS

received by January 20th appear in the February issue, subject to space limitations

Address copy to the
Departmental Staff
CONSTRUCTION METHODS
330 West 42nd St., New York City

EMPLOYMENT
BUSINESS OPPORTUNITIES

SEARCHLIGHT SECTION

Classified Advertising

EQUIPMENT
USED OR RESALE

CONCRETE PLANT EQUIPMENT

★ ★ ★ ★ ★ Ready for Prompt Shipment ★ ★

CONCRETE PLANT

5—REX 200 Double Pumpcrete Machines with 50 H.P., A.C., 60 cycle, 3 phase 220/440 Volt electric motors—complete with Pug-mill Ramifiers with 7 1/2 H.P., A.C., 60 cycle, 3 phase, 220/440 Volt Motors.

1—REX 200 Double Pumpcrete Machine with 50 H.P., A.C. motor and Rotary Ramifier.
2—Transfer Car Dollies—to be used for transferring Pumpcrete Units from Repair Line to active duty.

Also have complete supply of 8" Pipe in all lengths and supply of bands and miscellaneous fittings as well as a large supply of repair parts for all units.

HOT WATER HEATING SYSTEM

1—Type B Patterson combined hot water service and storage heater—120" dia. x 279" overall length—Storage capacity 12,000 gals., 500° water working pressure. Will heat 12,000 gals. in one hour from 40 to 125° with steam at 100° pressure tested for 180° and includes Thermostatic control valve.

1—Cleaver Brook, O.B. 30—Oilbitt steam generator plant. Will develop 10,000° steam hourly from and at 212° F. Approximately 300 H.P. boiler.

CONCRETE MIXER—TOWER

4—ME Koeberling 2 compartment drum concrete mixers—mounted on standard frames equipped with air compressor for operation of transfer and discharge chute; also Batchmeters, with 3 phase, 60 cycle A.C. motors.

10—Rectangular steel Concrete Towers arranged in 5 pairs. Height 44'6". These towers were used for Transia Concrete, being lined up on one side of a R.R. Barge, interconnected and fitted up with stationary and sliding hoppers to feed 15 ft. main pipes. The arrangement of each group of towers in 25'6" spacing and additional guides between each group. In between each tower is placed a 3 yd. hopper from which a 3 way chute is placed to divide the flow of concrete into either of three hoppers. Also 15—3 yd. hoppers are mounted on the sliding frames.

PUMPS

1—C.H. & E. Model #11, C.A., capacity 125 GPM at 120° pressure—4 1/2 x 1 1/2 single acting Triplex Road Pump with Waukesha 4 cylinder 45 H.P. gasoline engine.

1—Gorman Rupp—R 100, Triplex Pump on Trucks, 100 GPM at 400° pressure with Hercules 55/65 H. P. gasoline engine.

1—Gorman Rupp—R 125, Triplex Pump on Trucks, 125 GPM at 320° pressure with Hercules 40/50 H. P. gasoline engine.

BATCHER PLANT

1—Butler Bin Co. Four Compartment, 587 cu. yd. Bin as per Drawing CM 780-1. Bin bottom arranged to accommodate three weighing batchers, also includes aggregate and cement weighing batchers for 34 E Mixer.

1—3000 bbl. cement storage bin
2—244 Cement elevators and screw conveyors capacity 300 bbls. per hour.

1—145. Ransome Standard Building Concrete Mixer mounted on 4 R.T. Wheels complete with 4 cylinder, 20 H.P. gas engine with power loader.

2—Hais 35'—24" Portable Belt conveyor frames with 7 1/2 H.P. electric motors and with hopper gates.

CONVEYORS

5—Conveying Systems—Robins Conveying Belt Co.

1—Transfer Conveyor—36"x 20'

1—Stacking Conveyor—36"x 1000'

1—East Tunnel Conveyor—36"x 500'

1—West Tunnel Conveyor—36"x 500'

1—Mixing Plant Conveyor—36"x 256'

These units are complete with chutes and gates and all electrical equipment for its operation. Belting is Equator Brand, 6 ply, 28 oz. duck.

Bids will be accepted for all or any part of units offered for sale. Sale authorized by Bureau of Docks, U. S. Navy. Any or all equipment can be withdrawn at the discretion of the advertiser. Other miscellaneous equipment available. Send us your inquiries.

BAYONNE ASSOCIATES

U. S. NAVAL SUPPLY DEPOT

Bayonne 3-5800

BAYONNE, N. J.



**"Take care
of yourself,
Dad"**

Last year over 180 million man-days of productive time were lost through industrial accidents—many of them needless. Think how many tanks, ships, guns, planes those 180,000,000 man-days of work would have made! . . . Yes, dad—take care of yourself. Your soldier-son needs your factory production to win.

American Cable **TRU-LAY PREFORMED WIRE ROPE** is helping keep down accidents every day because it is a safer rope to use and handle.

TRU-LAY PREFORMED resists kinking and snarling. It resists whipping; spools better. Worn, broken and chisel-sharp crown wires refuse to wicker out to jab workmen's hands. They remain in place, making **TRU-LAY** much safer to handle.

Use American Cable **TRU-LAY PREFORMED** for your next rope. Do everything possible to reduce lost-time accidents. America needs your full-time production.

TRU-LAY

Preformed

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

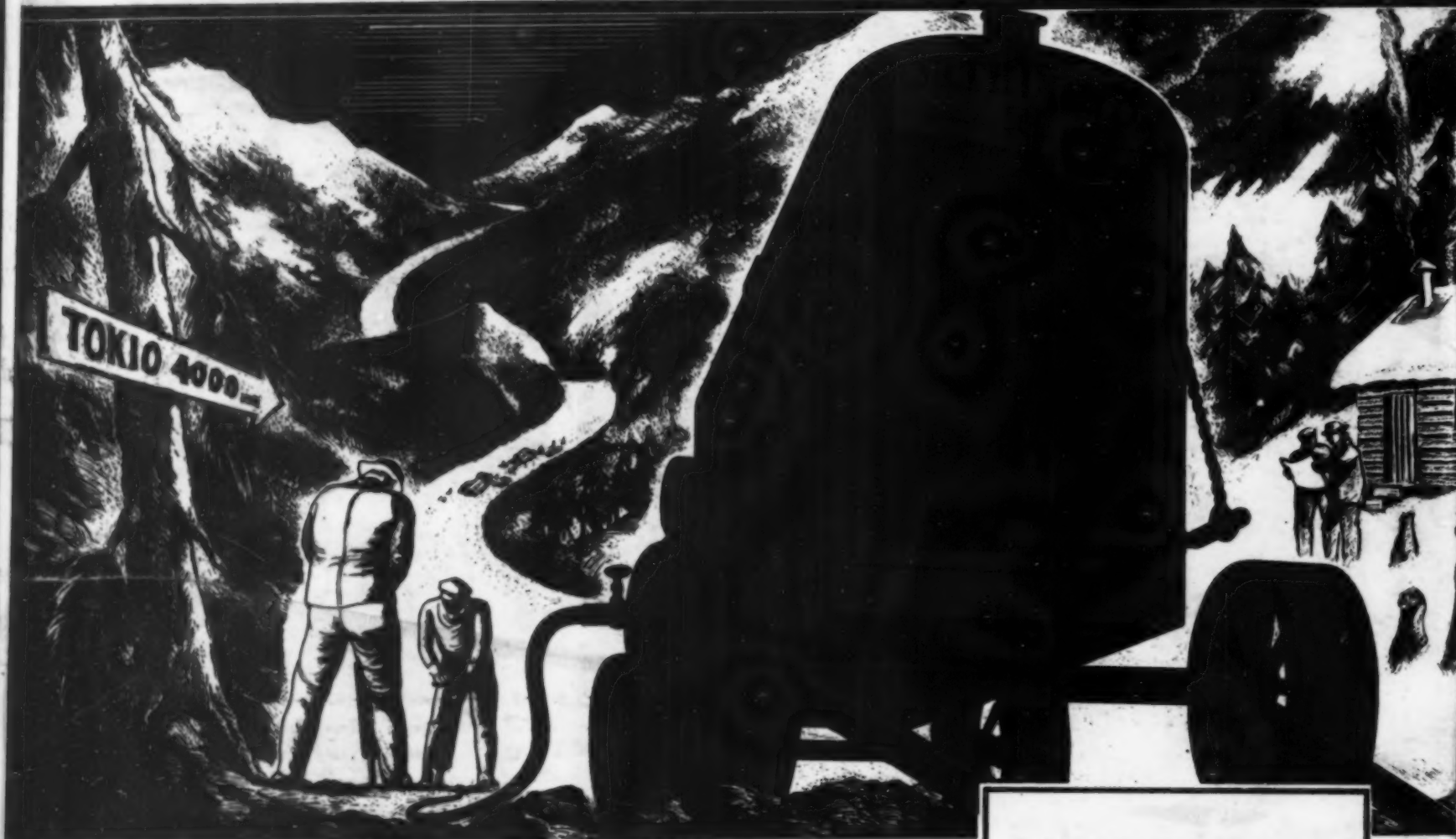
BRIDGEPORT, CONNECTICUT



ESSENTIAL PRODUCTS . . . AMERICAN CABLE Wire Rope, TRU-STOP Emergency Brakes, TRU-LAY Control Cables, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Iron Castings, CAMPBELL Cutting Machines, FORD Hoists and Trolleys, HAZARD Wire Rope, Yacht Rigging, Aircraft Control Cables, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

January, 1943 — CONSTRUCTION METHODS

AIR-POWER NORTH TO TOKIO...



Ask them along the road to Fairbanks what Blue Brutes can do. The builders wanted rock-blasting air-power they could count on for the toughest construction job since Panama. They took Worthington Blue Brute Compressors and Air Tools — in "uniforms" of olive drab.‡

Over 1200 miles of boggy marshland, swamp-traps, axle-busting mountain peaks, through mud and ice, they helped blast the Alcan highway through. Alaska's, Tokio's fate hangs by that road-thread. Blue Brutes stood action's test.

Worthington Blue Brute Compressors

‡Blue Brute Compressors and Air Tools are painted olive drab for the Army. *Reg. U. S. Pat. Off.

... portable and semi-portable ... gasoline, diesel and electric driven ... have staying power in a pinch because like road-trained champion heavy-weights they're gentle-breathing. The improved Feather* Valve stops gulping "back talk", when lesser breeds whine for the tool shed. *They deliver more air, steadily, per power-dollar.*

Smooth, easy-handling strength makes Worthington Rock Drills and Air Tools also your best "brutes" for fast, historic construction. Sturdy, quality-strong, *they use less air.* Your test will prove it.

Behind the Fighting Fronts
with

BLUE BRUTES

A famous West Coast shipbuilder, who recently broke all records building Liberty Ships, buys Blue Brutes to provide air-power for a multitude of operations, 24 hours a day. Blue Brutes are performing like this in hundreds of Army camps, Navy yards, air bases and ordnance plants throughout the country. Your nearest distributor is listed on page 132

Get more **WORTH** from air with **WORTHINGTON**
BUY BLUE BRUTES



Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have

always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON



Worthington Pump and Machinery Corporation, Harrison, N. J. Halyoke Compressor and Air Tool Department, Halyoke, Massachusetts